JANUARY 24, 1955

Electrical World

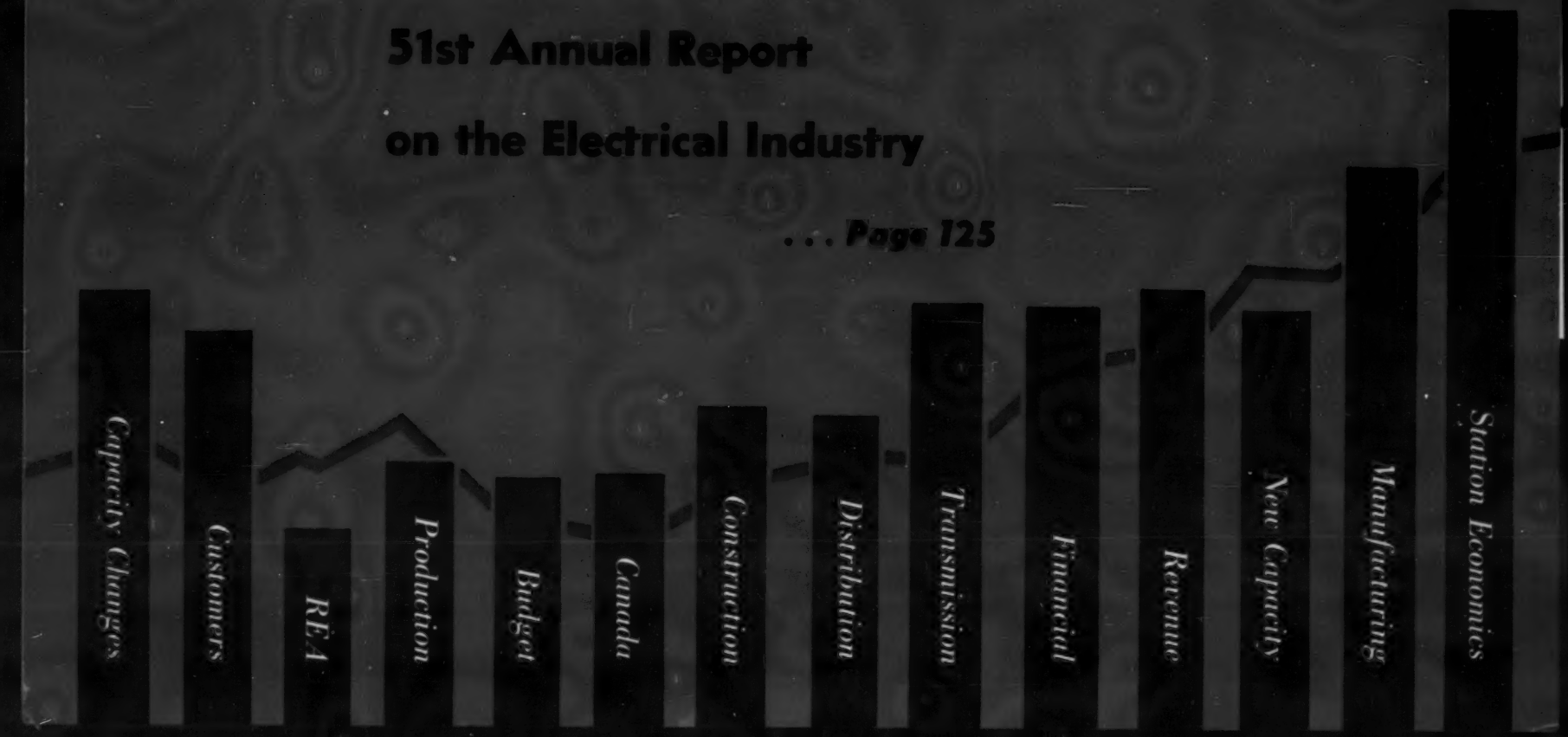
PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION

Industry Statistics

51st Annual Report on the Electrical Industry

. . . Page 125



5 Ratings allow for System Growth

THERE IS PLENTY OF ROOM for system growth because the *Vari-Amp* feature on these Allis-Chalmers single-phase power regulators permits operation at 5 ranges of regulation instead of one half-range setting. Initial cost is lower in most instances. In addition, the *Vari-Amp* feature provides extra short-circuit capacity. No other single-phase power regulator offers flexibility like this.

Unequal Range Gives Full 10% Buck Even at Increased Current Ratings

The *Vari-Amp* feature also permits retaining full 10% buck even at increased current ratings. Then the regulator operates at heavier loads in a "raise" direction . . . at lighter loads in a "lower" direction.

In addition to those important multiple ratings, you get low exciting current, low maintenance, and close, accurate control with Allis-Chalmers single-phase power regulators. Get the full story. Contact your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 01B6065C.

A-4461

Vari-Amp feature makes possible these additional ratings

Volts	Kva of Regulator	±10%	±8⅓%	±6⅔%	±5%	±2½%
2400	12	50 amp	57 amp	66.5 amp	80 amp	100 amp
	24	100	114	133	160	200
	36	150	171	200	240	300
	48	200	229	267	320	400
	60	250	286	334	400	
	72	300	343	400		
	96	400				
4800	12	25	28.6	33.3	40	50
	24	50	57	66.5	80	100
	36	75	85.7	100	120	150
	48	100	114	133	160	200
	60	125	143	167	200	250
	72	150	171	200	240	300
	96	200	229	267	320	400
	120	250	286	334	400	
	167	348	397			
6900	17.3	25	28.6	33.3	40	50
	34.5	50	57	66.5	80	100
	69	100	114	133	160	200

Extra Short-Circuit Capacity Available

25 times normal short-circuit capacity available with each of these current ratings gives short-circuit capacities as high as 10,000 amperes on smaller units.

ALLIS-CHALMERS

Originators of 5/8% Step Regulation

Electrical World

Vol 143 No 4 January 24, 1955

EDITORIALS—Pertinent comment on the industry's problems and accomplishments 109

THE ELECTRICAL WEEK—Last minute news briefly told 110

NEWS—Complete coverage of activities affecting the industry 112

FEATURES:

GENERATOR MOVES 9 MILES ON DECK OF PLANKS 118

COMMONWEALTH EDISON CO PROVES ITS "DISASTER PLAN" 120

1954: THIRD BEST APPLIANCE YEAR 122

51ST ANNUAL STATISTICAL SECTION 125

OUTSTANDING FACTS	126	PRODUCTION	142
BUDGET	127	REVENUE	144
CONSTRUCTION	128	FINANCE	148
EXPENDITURES	130	REGULATION	152
NEW CAPACITY	132	LABOR	153
TRANSMISSION AND DISTRIBUTION	133	CAPACITY	154
T&D CONSTRUCTION	134	STATION ECONOMICS	157
T&D EXPENDITURES	136	MANUFACTURING	159
MAINTENANCE	137	CANADA	162
CUSTOMERS	138	CAPACITY CHANGES	164
SALES	140	REA	172

HOW TO—Practical ideas for those who design, construct, operate, and maintain 177

INDUSTRIAL APPLICATIONS—Successful applications of electricity in industry 196

SALES AND SERVICE—Commercial, rural, and residential uses of electricity 202

MANUFACTURERS & MARKETS—Information on electrical manufacturers and today's markets 254

NEWS ABOUT PEOPLE—Personnel changes throughout the industry 260

• • •

Engineering Reference Sheet	184	Index of Advertisers	272
New Equipment	208	Public Relations	274
Catalogs and Bulletins	248	Readers Forum	276
Technical Literature	250	Technical Notes	278
Books	252	Washington Comment	278
Meetings Calendar	266	Finance and Regulation	280
Statistics	283		

Published for 81 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

FISCHER BLACK, Publisher and Editor
JESSE MOCK ..... Asst to the Editor

DANIEL T BRAYMER ..... Managing Editor
LEONARD M OLMSTED ..... Associate Editor
KENNETH K KOST ..... Associate Editor
HERBERT R FRANKEL ..... Associate Editor
RUE M SHOOP ..... Associate Editor
GEORGE SWIFT ..... Associate Editor
V CRAIG RICHTER ..... Associate Editor
EDWARD ALLEN ..... Midwestern Editor
HOWARD S KNOWLTON ..... New England Editor
JOHN J KEARNEY ..... Middle Eastern Editor
FRANCIS KOVALCIK ..... Western Editor
DAVID REA ..... Northeastern Editor
JEANNE BERNHARDT ..... News Editor
IRIS ST. CLAIR ..... Departmental Editor
E BRYSON SESSIONS ..... Assistant Editor
ALLEN LONG ..... Assistant Editor
ARY MOSSIMAN ..... Manager of Market Research
JOAN STEEN ..... Statistician
W J WALLACE, JR ..... Art Director
DENISE HENNESSY ..... Production Editor
G B BRYANT, JR ..... Mgr. Washington Bureau
W. GILMOUR ..... Washington Correspondent
DEXTER M KEEZER ..... Dir Economics Dept
RICHARD W EVERETT ..... Economics Dept
A E KNOWLTON ..... Consulting Editor

DOMESTIC NEWS SERVICE: Atlanta, Chicago, Cleveland, Detroit, Houston, San Francisco.

WORLD NEWS BUREAU: John Wilhelm, Editor, Bonn, London, Mexico City, Paris, Sao Paulo, Tokyo.

WARREN W SHEW ..... Sales Manager

DISTRICT MANAGERS: E F Coffey, New York; N V Palmer, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; E S Chapin, Detroit; W H Meneilley, Chicago; J T Schaefer, St. Louis; C W Dysinger, Los Angeles; R C Alcorn and T H Carmody, San Francisco; William Lanier, Atlanta; James Cash, Dallas.

OTTO DRECHSEL ..... Business Manager

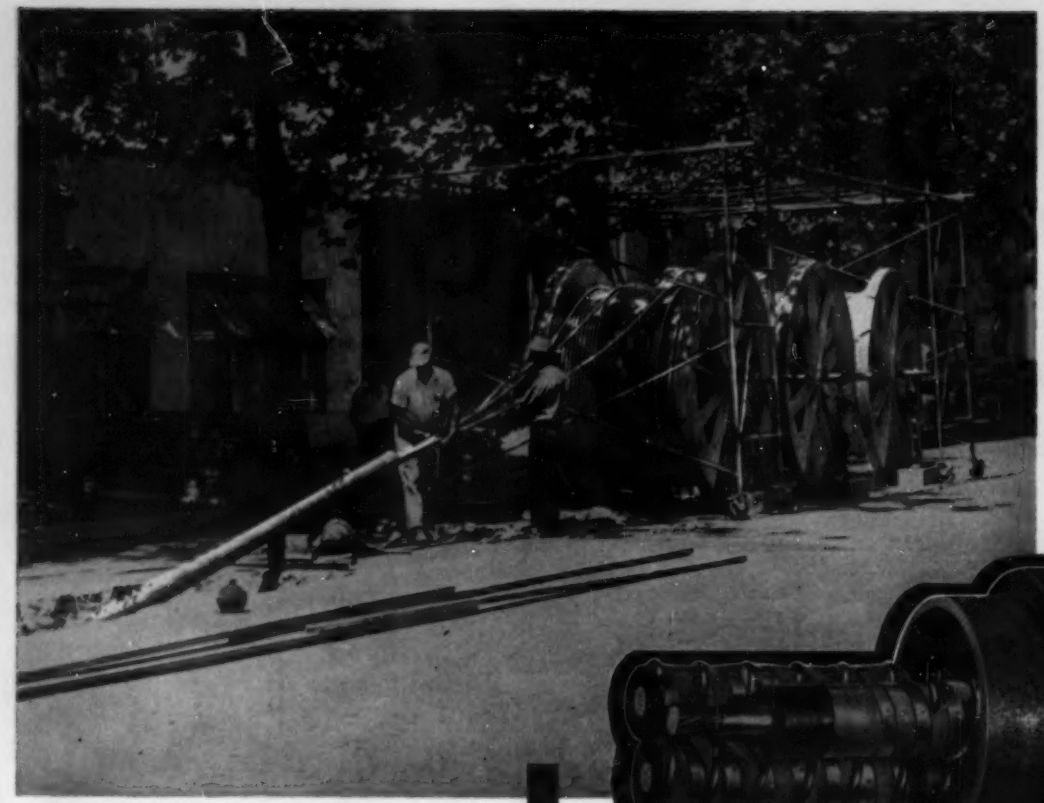
ELECTRICAL WORLD

Published weekly by McGraw Hill Publishing Company, Inc.; James H. McGraw (1860-1948), Founder. Publication Office, 99-129 N. Broadway, Albany 1, N. Y. Executive, Editorial and Advertising Office, McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cosby, Secretary; Paul Montgomery, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

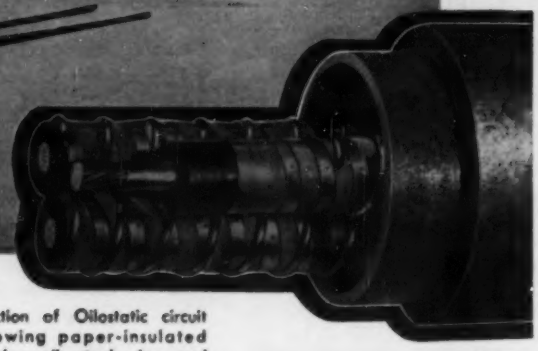
Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are accepted only from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields. Position and company connection must be indicated on subscription orders.

Single copies 35¢. For the United states and possessions $6 a year, $9 for two years, $12 for three years. Canada, $7 for one year, $11 for two years, $14 for three years. (Canadian funds at par.) Other Western Hemisphere, and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $39 for two years, $50 for three years. Entered as second-class matter, November 10, 1930, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in USA. Copyright 1955, by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.



Three conductors for one of the two 115kv Oilostatic circuits are pulled in.



Section of Oilostatic circuit showing paper-insulated cables, oil, steel pipe and corrosion protective covering.

another utility selects

OILOSTATIC

for economical high voltage transmission

In Sacramento, California, Oilostatic Transmission Systems for two 8,800 foot 115kv circuits were buried directly under the city streets. Simplicity of installation, economy, and service-proved reliability dictated the choice of this type of installation to carry 70 MVA per circuit.

Oilostatic Systems consist of paper-insulated cables in a welded steel pipe filled with oil under 200 psi pressure. This system provides maximum dielectric strength, stability, and current-carrying capacity. Automatic pressure controls and indicating instruments reduce the necessity for inspection to an absolute minimum.

Compact construction is ideal in tunnels, on bridges or under congested streets instead of bulky duct banks. Oilostatic is also adaptable for submarine installations. Write for full information on design and installation of Oilostatic Transmission Systems to The Okonite Company, Passaic, N. J.

OKONITE SINCE 1878 ***insulated cables***

2429

10,000 FEET OF CONDUIT RODDED IN 8 HOURS!

Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.

EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.

OTHER *Electroline* PRODUCTS

Electroline Company

4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO

ARE YOU SECTIONALIZING YOUR FEEDERS AT

Now the simpler operating methods possible with S&C Load Interrupters can save equipment costs at sectionalizing points by almost one half.

S&C Load Interrupters can switch the circuit *without any external arcing.*

This means you can now use stick operation at many points where the present practice is group operation . . . group operation perhaps for the single purpose of actuating disconnects or horn-gaps when mounted upright at pole-top locations to give the necessary clearances for their rising arcs.

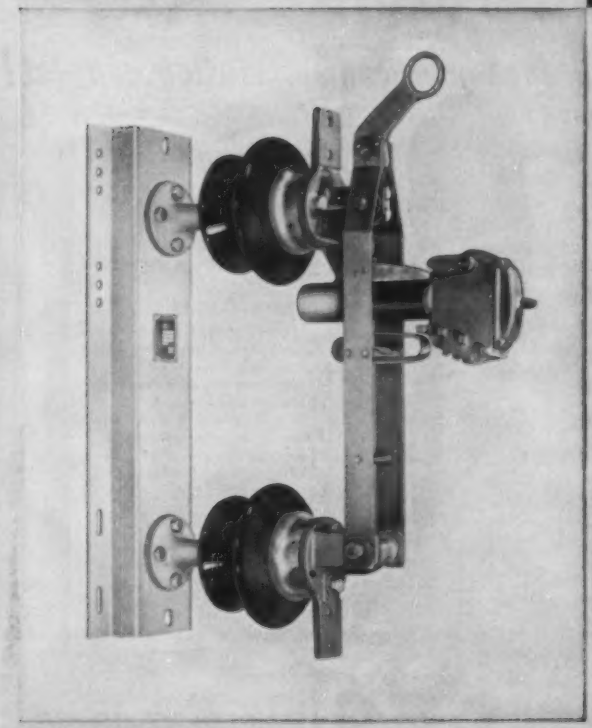
With the stick-operated* Load Interrupter, you actually save three ways: (1) No costly operating mechanism and pole-top frame to purchase; (2) Installation labor radically lowered; (3) Maintenance and adjustment costs reduced to a minimum.

Of course this cost-saving is just part of the story. Since the Load Interrupter can switch the circuit under any condition except short circuit, it permits completely new practices in switching distribution feeders.

**However, S&C Load Interrupters may also be obtained for group operation.*

Would you like to read more about the S&C Load Interrupter and how it saves money while improving operating practices? Write today for Catalog Section 760.

DISTRIBUTION LOWEST COST?



Inverted Interrupters are readily accessible for operation with a hook stick.

Single-pole Load Interrupters for vertical mounting—14.4 kv 600 amp.

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE
CHICAGO 40, ILLINOIS, U. S. A.

IN CANADA:
S & C ELECTRIC CANADA, LTD.
5 Vanston Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

Specialists in High-Voltage Circuit Interruption

Cochrane Deaerators

. . . give you the best boiler insurance your central station can get!

With expensive boiler and feed pumps at stake, you need UNQUALIFIED DEAERATING PERFORMANCE. A condenser-deaerating hot well has limitations, so why take any chance? A Cochrane Deaerator with water storage provides inexpensive insurance against frozen feed pumps resulting from momentary feed failure . . . boiler corrosion due to improper deaerating system . . . or even boiler shutdown.

It is impractical to maintain continuous deaeration in condenser hot wells under vacuum conditions to the degree possible in a Deaerator operating at positive pressure.

There is no question that the Cochrane Deaerator assures superior performance . . . why gamble on uncertainties? Use Cochrane Deaerators and be sure.

For further details on Cochrane Deaerators, write for Publications Nos. 3005, 4643, 4635.

Other Cochrane Processes

DEMINERALIZER

For high pressure boiler makeup, Cochrane Demineralizers deliver a continuous supply of demineralized, silica-free water at extremely low costs. Designs cover 2, 3, and 4-bed or mixed bed units, manually or automatically controlled. Request Publication No. 5800.

92

Cochrane

CORPORATION

3146 No. 17th STREET, PHILADELPHIA 32, PA.

NEW YORK • PHILADELPHIA • CHICAGO

Representatives in 30 principal cities in U. S.; Toronto, Canada; Mexico City, Mexico; Paris, France; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.

Pottstown Metal Products Division—Custom built carbon steel and alloy products

COCHRANE CORPORATION
3146 NO. 17TH ST., PHILA. 32, PA.
Send me a copy of Publication Nos. 3005, 4643, 4635, 5800. (Circle publication desired).

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blow-Off • C-B Systems • Specialties

LOOK TO

FROST

for the best pole supply TODAY and in 1995

Forty . . . fifty . . . or a hundred years from now your orders for Frost pressure-creosoted poles will be filled as promptly as they are today. And here's why . . .

- We own over 450,000 acres of fine timberland managed on a self-perpetuating basis, which means a controlled harvest, plus re-growth, for a never-ending supply of fine pole trees.
- Frost's modern facilities include the treating plant in Shreveport acquired so that we can control quality and better serve your pole needs.
- The expert technical staff that knows how to turn out good poles provides complete service in the tradition of all Olin Mathieson products.

All the 62 years of successful, diversified, business experience enjoyed by Olin Mathieson Chemical Corporation stand behind all Frost products.

We're planning today to fill your 1995 orders for pressure-creosoted Southern Pine poles.

Frost

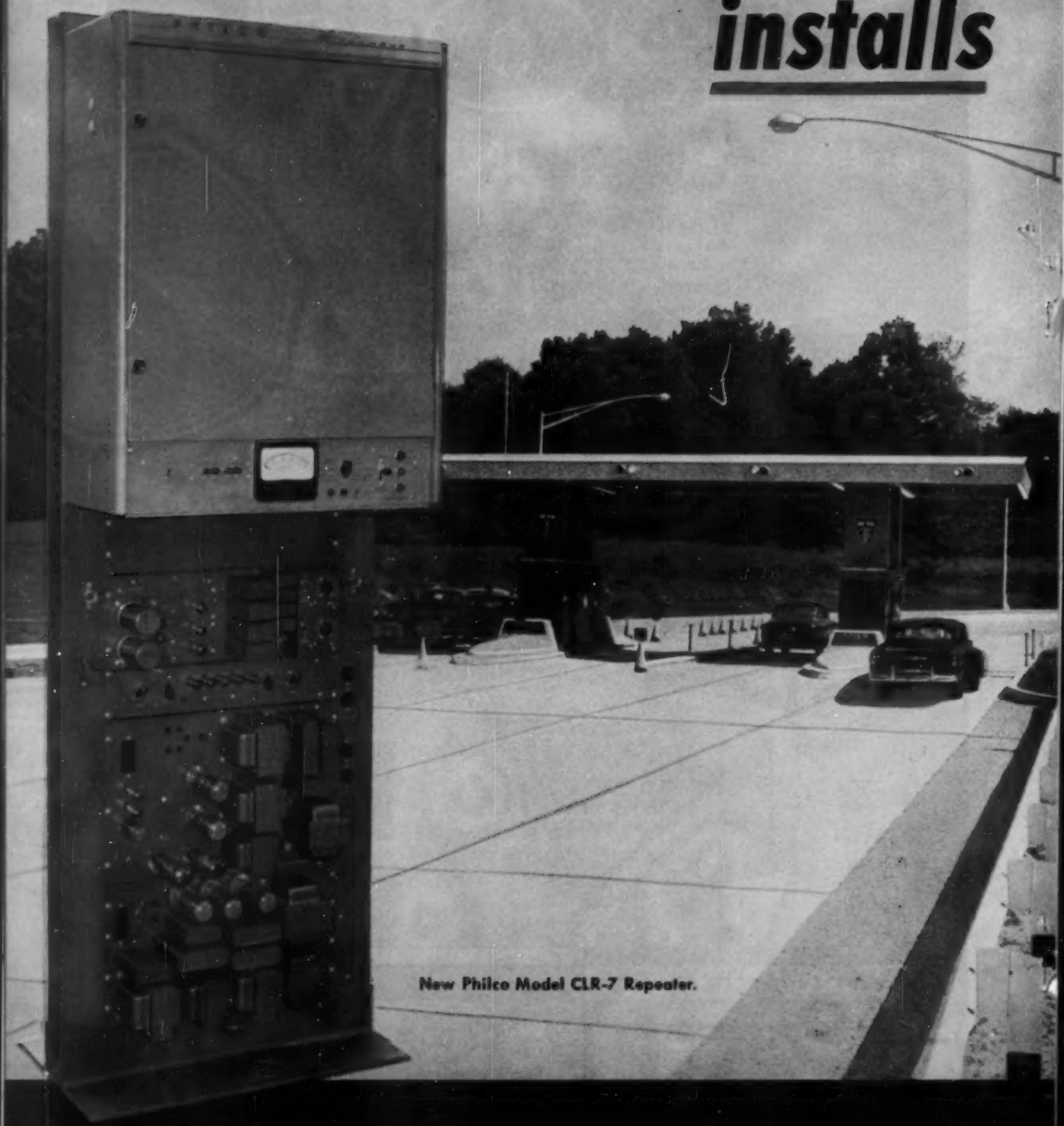
FOREST PRODUCTS DIVISION

OLIN MATHIESON CHEMICAL CORPORATION

Producers of

Mathieson Industrial and Agricultural Chemicals • Powell Insecticides • Super Pyro and U.S.I. Permanent Anti-Freezes • Squibb Pharmaceuticals • Lenthéric Cosmetics • Olin Cellophane and Polyethylene Film, Industrial Explosives, Electrical Products • Western Brass Non-Ferrous Alloys and Fabricated Metal Parts • Western—Winchester Sporting Arms and Ammunitions • Ecusta Fine Specialty Papers • Ramset Powder-Actuated Fastening Tools • Frost Golden Pine and Hardwood Lumber

THE *NEW* WEST VIRGINIA *installs*



New Philco Model CLR-7 Repeater.

PHILCO CORPORATION

TURNPIKE
PHILCO MICROWAVE!

A Great New Superhighway—with the Most Modern Communications

Now open to traffic, the West Virginia Turnpike marks completion of one of the most difficult road-building projects in the nation's history. In the words of C. H. Peterson, Project Engineer for Howard, Needles, Tammen & Bergendoff, Consulting Engineers: "Mountains had to be literally moved into valleys, before paving could begin on sections of the 88-mile throughway" which extends from Charleston to Princeton, West Virginia.

For greatest safety and efficiency in traffic control, the turnpike is equipped with the new Philco Model CLR-7 microwave communication system, which features simplicity, economy and continuous unattended operation—*it virtually runs itself, 24 hours-a-day!*

The complete communication system consists of a multi-hop microwave system integrated with VHF two-way radio installed in 10 base stations and 24 mobile police, fire protection and highway maintenance vehicles. The range of these VHF units is extended to the entire length of the turnpike by the microwave system.

Philco maintains a staff of experienced field and system engineers, to help you plan your communication system . . . to install and maintain it—*at surprisingly low cost.* Phone or write Philco, Dept. EW today for information without cost or obligation.

Microwave dish at Malden Terminal Station.

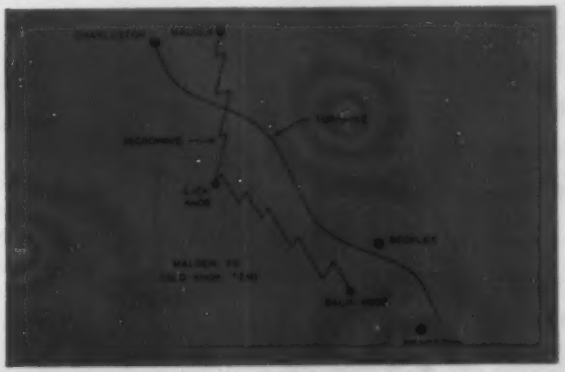


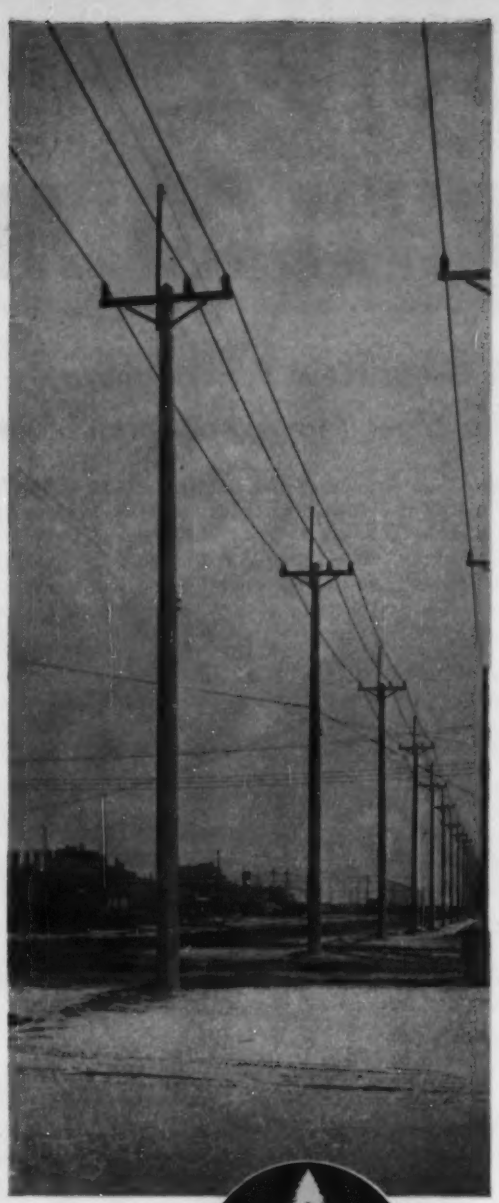
Diagram of Turnpike and Microwave Routes.

Microwave Terminal Station at Bald Knob.

GOVERNMENT AND INDUSTRIAL DIVISION • **PHILADELPHIA 44, PENNSYLVANIA**

IN CANADA: PHILCO CORPORATION OF CANADA LIMITED, DON MILLS, ONTARIO

STOP
costly pole-line replacements!



...INSTALL

LIFE-SPAN
WESTERN RED CEDAR POLES

and get longer pole-line service — lower pole replacement costs!

Have you looked at your yearly pole-line replacement costs lately? Want to lower them and show less annual maintenance costs—more yearly profits? You can—just specify LIFE-SPAN Western Red Cedar Poles when you plan overhead construction.

LIFE-SPAN Poles are treated from top to butt—they're safe, easy to handle. Not only do they assure lower annual pole replacement costs, they create good public relations everywhere they are used.

CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA

BUILT BY NATURE

Life Span

SOLD ONLY BY THE FOLLOWING

Naugle Pole & Tie Corp.
Chicago, Illinois

Page & Hill, Inc.
Minneapolis, Minnesota
80 Church St., New York, N. Y.

B. J. Carney & Co.
Spokane—Minneapolis

Schaefer-Hitchcock Co.
Sandpoint, Idaho
(Suppliers for Joslyn Mfg. & Supply Co.)

Hi-Velocity INTERRUPTER

snaps open with sling-shot speed

■ For gang-operated switches, this new Hi-Voltage, Hi-Velocity Interrupter assures an economical and dependable way to:

1 Switch capacitive currents

2 Interrupt transformer magnetizing currents

A few of its distinctive features are: (1) only three parts; (2) non-corrosive; (3) tremendous "sling-shot" action; (4) exclusive damping action; (5) strong, sturdy and durable; (6) independent operation and (7) positive electrical contact.

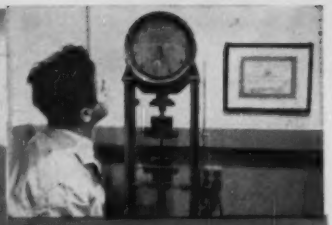
■ **Ask your Joslyn Representative to tell you more about this new Hi-Velocity Interrupter or write to us for Descriptive Bulletin HV 10-200.**

HI-VOLTAGE EQUIPMENT COMPANY

DIVISION OF JOSLYN MFG. & SUPPLY CO.

4000 EAST 116th STREET • CLEVELAND 5, OHIO

UTC Safeguards TRANSFORMER RELIABILITY with NATVAR Seamless Bias VARNISHED CAMBRIC



One reason UTC transformers can carry a strong materials-workmanship-performance guarantee is that all incoming materials are thoroughly tested against specs before they are accepted and used. Here, tensile strength of insulation is being checked.

Other quality control tests are made as fabrication progresses. Corrosion resistance of insulating materials is checked as coil assemblies are tested.

After being overloaded until they fail, units are dissected and given a microscope examination to determine the cause of failure. The analysis guides development toward still higher reliability standards.

THE UNITED TRANSFORMER COMPANY, New York, manufactures high reliability transformers ranging from one-third ounce subminiatures to units weighing several hundred pounds. They recently shipped their ten millionth military transformer.

At UTC a great deal of the credit for their present position of leadership goes to the engineering and quality control staffs and the best of laboratory facilities. These are supplemented by a separate Material Testing Laboratory where all electrical insulating materials are evaluated. Natvar Seamless Bias Varnished Cambric is used because it consistently meets requirements. Natvar Varnished Tubing and Straight Cut Varnished Cambric are also used.

Natvar flexible insulations are dependably uniform no matter when or where they are purchased. They are available either from your wholesaler's stock or direct from our own.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Vinyl coated—varnished—lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 23

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

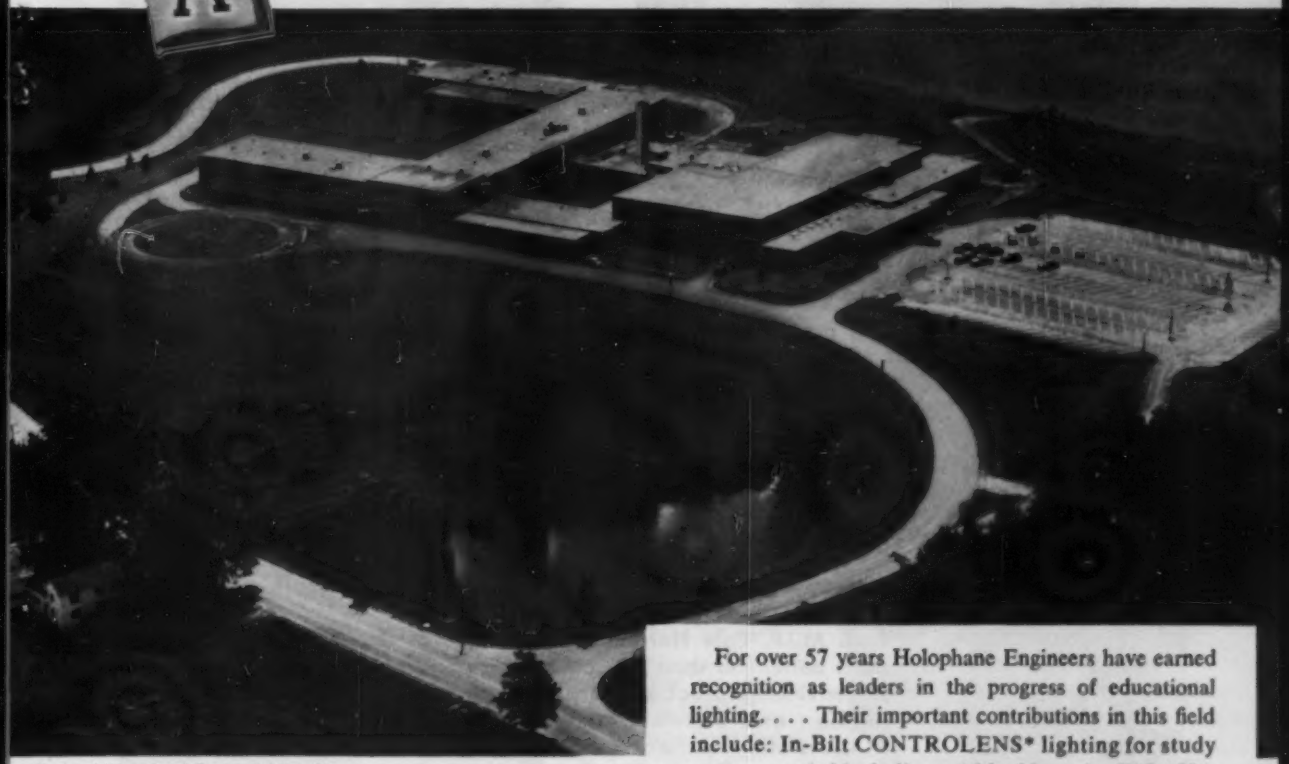
221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

Q ***...WHAT*** *is the Foremost Institutional Project in America?*

A **The Multi-Billion-$ EDUCATIONAL BUILDING PROGRAM**

Q ***...WHO*** *are Recognized Authorities on Educational Lighting?*

A **Unquestionably, the HOLOPHANE ENGINEERING STAFF**



Regional Educational Center, Holden, Mass.

For over 57 years Holophane Engineers have earned recognition as leaders in the progress of educational lighting. . . . Their important contributions in this field include: In-Bilt CONTROLENS* lighting for study rooms, assembly halls and blackboards; HIBAY*, LOBAY* and REFRACTOLENS* lighting for recreational areas, and many other major developments.

Today, with this unique experience and specialized skills, Holophane is finding new and better ways to meet the lighting needs of expanding educational facilities—in colleges, as well as secondary schools.

Architects, engineers and educational administrators are invited to call in Holophane Engineers—at headquarters or in the field—for consultation without obligation.

For Better Lighting Be Specific . . .

Write for "Guide to Lighting Educational Institutions"

HOLOPHANE

HOLOPHANE COMPANY, INC.

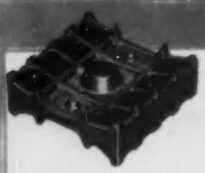
Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N.Y.
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

*Ⓡ

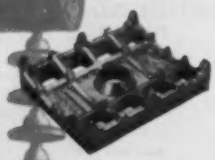
IN EVERY LINE OF DUTY . . .

M.I.F. POLE HARDWARE MEANS DEPENDABLE PERFORMANCE

SPAR ARM GAIN


DOUBLE GRID GAIN

CROSSARM GAIN


GRID GAIN

TIMBER CONNECTOR

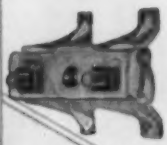
POLE EYE PLATE

GUY HOOK

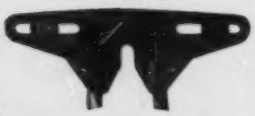
GUY CLAMPS

CURVED WASHERS

AERIAL CABLE SUSPENSION CLAMPS



POLE MOUNT


TRANSFORMER MOUNTING PLATE

POLE BEARING PLATE

Each M.I.F. Pole Hardware Specialty was designed to do a better job than had ever been done before. There is convincing proof of duty well performed on transmission and distribution lines from coast to coast. M.I.F. Pole Hardware can be depended upon to improve performance, simplify inventory and provide longer service life.

MALLEABLE IRON FITTINGS CO.

Pole Hardware Division Branford, Connecticut

N.Y. Office: 30 Church St. Boston Office: 250 Stuart St.

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

MIF

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill., Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn., • William J. O'Brien, Memphis, Tenn., • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S.C. • Waltham, DeWitt & Krusi, San Francisco, Calif. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas and Houston, Tex. • O. C. Witte Co., Detroit, Mich.

New CONGESTION-FREE MICROWAVE SYSTEM

Now offered You by RCA for the Uncrowded 2450-2700 mc Band

If you've hesitated about Microwave because of any concern about spectrum congestion in certain areas, you'll welcome news about RCA's revolutionary MM-26. First to operate in the uncrowded 2450-2700 megacycle portion of the microwave spectrum, this new system, *offered only by RCA* means:

NO CONGESTION—PEAK DEPENDABILITY

No perplexing engineering problems to solve in getting your system oriented. And your system won't be subject to interference from systems now in operation, thus providing all-time reliability. Single side band suppressed carrier frequency division multiplex is used exclusively to meet highest standards of dependability.

PROTECTION AGAINST OBSOLESCENCE

Available frequency space is utilized most efficiently, offering more systems in one band, thus giving added protection against obsolescence—a major economic advantage. The new system can feed into existing RCA systems and so be added to your present equipment.

HIGH SIGNAL-TO-NOISE RATIO

Up to 30 high-performance voice channels of famous RCA quality, or several hundred teletype and signalling channels are provided in one system. You get high signal-to-noise ratio, clearer telephone conversations, less distortion, less cross talk. You can expect better voice channel performance, dependable telemetering and facsimile, all-weather performance.

"BUILDING-BLOCK" ADAPTABILITY

RCA's 12 basic units are readily interchangeable, which means you can put together a wide variety of stations, each designed to provide a specific combination of facilities. You get equipment exactly to your specifications, each combination being clearly explained on catalog sheets. Integrated operation of all units assures convenience and versatility in system planning, uniformly high performance.

EASY INSTALLATION—SERVICING

Conventional triode tubes, unregulated power supply, familiar circuits, obviate the need for specially trained personnel. Tuning is simplified because the frequency is controlled from the terminal through the entire system.

Microwave is today's most modern form of radio for private communications systems. A radio beam carries communications and control signals from one place to another, following a narrow line-of-sight path. RCA was one of the first to pioneer in Microwave. Today its installations cover the nation and the globe. Only RCA systems provide so many advanced engineering features. Microwave specialists will be glad to answer any questions and plan your installation. Mail Coupon below for further particulars.

New stylized racks with doors feature modern functionalized design and open back for ease of servicing. Open cabinet shows complete Microwave Terminal. Closed rack shows stand-by equipment.

RCA®

RADIO CORPORATION of AMERICA

COMMUNICATIONS EQUIPMENT
CAMDEN, N. J.

Radio Corporation of America
Communications Equipment
Department M-45, Building 15-1, Camden, N. J.

Please send me new booklet on RCA MM-26 Microwave—a system for the uncrowded 2450-2700 mc band, designed for pipelines, utilities, railroads, turnpike, common carrier.

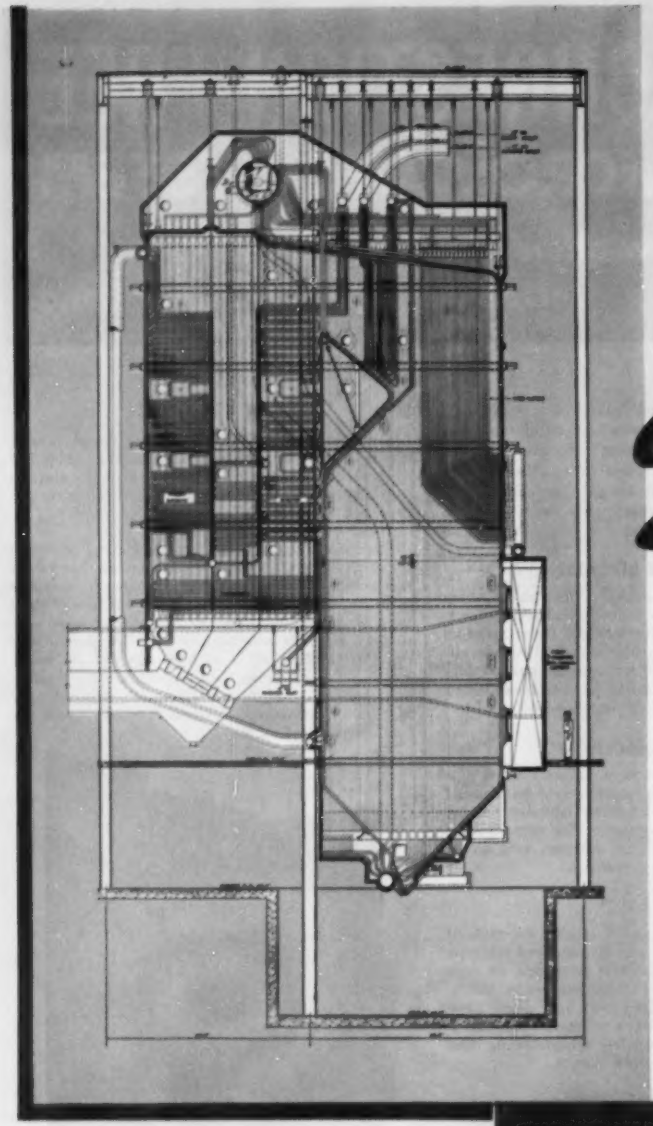
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

☐ Have an RCA Representative get in touch with me.



600,000 lbs/hr will more than at Florida Power

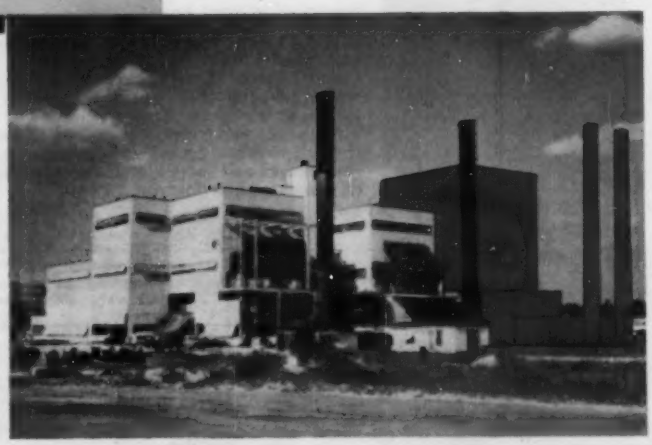
Suwanee

Riley Reheat Unit for Suwannee River plant will feature superheat and reheat steam temperature control without use of spray. Unit is designed to burn low grade oil, natural gas, with provisions for burning pulverized coal in future.

Feed Water Temp.	457 F.
Capacity	600,000 lbs/stm/hr
Superheat Pressure	1550 psig
Superheat Temperature	1000 F.
Reheat Pressure	450 psig
Reheat Temperature	1000 F.
Furnace Width	27′-3 15/16″
Furnace Depth	22′-7 5/8″
Heat Release in Furnace (oil)	
Btu per cu. ft. per hr.	22,800
Btu per sq. ft. per hr.	95,000

Black and Veatch
Consulting Engineers

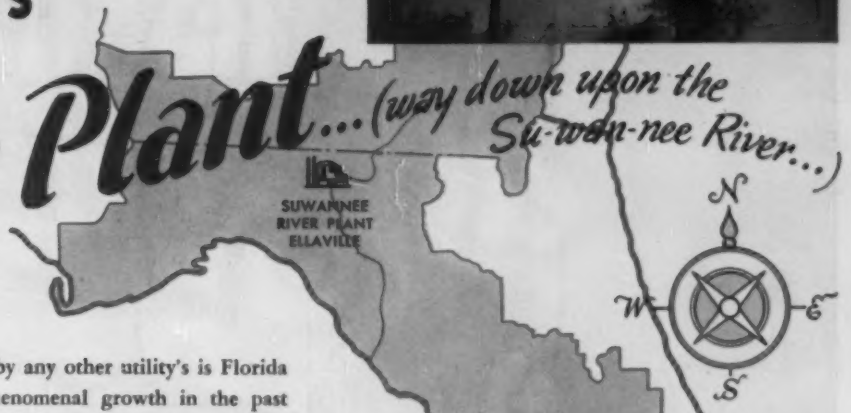
The Riley Unit, the largest of the three units at the Suwannee River Plant will more than double the kilowatt output. Construction will start soon and is scheduled for completion by end of 1956.



RILEY DESIGNS, MANUFACTURES AND INSTALLS COMPLETE STEAM GENERATING UNITS AND

RILEY Reheat Unit double Kw output Corporation's

River Plant... (way down upon the Su-wan-nee River...)



Almost unmatched by any other utility's is Florida Power Corporation's phenomenal growth in the past ten years . . . and no wonder . . . look at the remarkable growth area it serves . . . thirty-one thriving Florida counties, and nineteen South Georgia counties through its wholly-owned subsidiary Georgia Power and Light Company! Riley Stoker Corporation shares in this growth with a 600,000 lb/hr reheat steam generating unit, that, when installed, will bring Florida Power's net system generating capability to 600,000 kilowatts . . . a far cry from the mere 87,500 kilowatts that the company produced as recently as 1944.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Boston, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Tulsa, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

Florida Power Corporation is one of many important public utilities that in recent years have ordered Riley Reheat Units...

Utah Power & Light Company
Gadsby Station
1-575,000 lbs/hr; 1700 psig; 1000/1000F.

Louisiana Power & Light Company
Nine Mile Point Station
1-1,000,000 lbs/hr; 1725 psig; 1005/1005F.

City of Los Angeles, Dept. of Water & Power, Valley Steam Plant
2-1,200,000 lbs/hr; 2075 psig; 1000/1000F.

Houston Lighting & Power Company
Deepwater Station
1-1,200,000 lbs/hr; 2125 psig; 1005/1005F.

Houston Lighting & Power Company
Sam Bertron Steam-Electric Station
1-1,200,000 lbs/hr; 2125 psig; 1005/1005F.

Texas Electric Service Co.
Fort Worth
1-1,250,000 lbs/hr; 2125 psig; 1005/1005F.

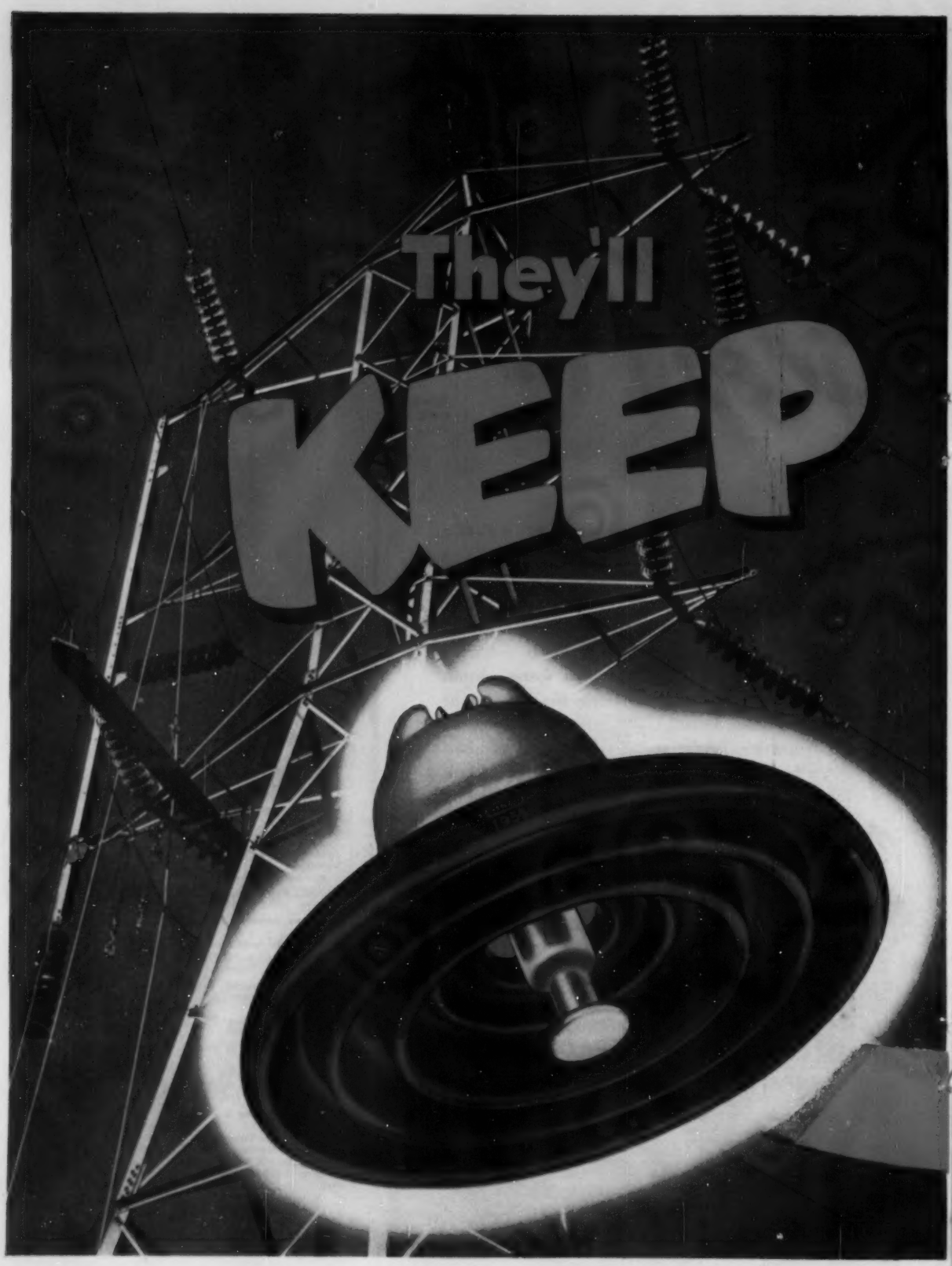
Public Service Co. of Indiana, Inc.
Wabash River Station
1-805,000 lbs/hr; 2075 psig; 1005/1005F.

Central Louisiana Electric Company, Inc.
Teche Station
1-350,000 lbs/hr; 1050 psig; 1005/1005F.

Public Service Co. of Indiana, Inc.
New Albany Station
2-1,000,000 lbs/hr; 2075 psig; 1005/1005F.

Dairyland Power Cooperative
Alma, Wisconsin
1-390,000 lbs/hr; 1650 psig; 1005/1005F.

FUEL BURNING EQUIPMENT FOR PUBLIC UTILITY AND INDUSTRIAL POWER AND HEATING PLANTS


They'll
KEEP

Pennsylvania Electric Company
Florida Power Corp.
Puerto Rico Water Resources Authority
Metropolitan Edison Company
Kansas Gas & Electric Co.
New York State Electric & Gas Co.
Pennsylvania Power & Light Co.
Iowa Power & Light Company
Staten Island Edison Corp.
Montana-Dakota Utilities
Eastern Kansas Utilities
Minnesota Power & Light Co.
Louisiana Power & Light Co.
Idaho Power Co.
Philadelphia Electric Company
Long Island Lighting Co.
Virginia Electric & Power Co.
Ohio Edison Co.
Cincinnati Gas & Electric Co.
Wisconsin Public Service Corp.
Green Mountain Power Corp.
Central Illinois Elec. & Gas Co.
Georgia Power & Light Company
Gulf Public Service Co.
Hawaiian Electric Company
Western Light & Telephone Co., Inc.
Lake Superior District Power Co.
Southern Indiana Gas & Electric Co.

'EM UP

for you, too!

Bangor Hydro Electric
Houston Lighting & Power Company
Manilla Electric Company
Louisville Gas & Electric Co.
South Carolina Electric & Gas Co.
Memphis Light, Gas & Water Div.
Tucson Gas, Electric Light & Power Co.
Southern Utah Power Company
Oklahoma Gas & Electric Company
Delaware Power & Light Company
Missouri Power & Light Company
Potomac Electric Power Company
Northwestern Public Service Co.
Stone & Webster. Northern States Power Compa
Public Service Electric & Gas Co.
White Mountain Power Company
Iowa Electric Light & Power Co.
Central Ohio Light & Power Co.
Missouri Public Service Corp.
Frontier Power Co. Kentucky Utilities Company
Southwestern Public Service Co.
Atlantic City Electric Company
Toledo Edison Company Montana Power Co.
Appalachian Electric Power Co.
Arkansas Power & Light Company
Iowa Southern Utilities Company
Carolina Power & Light Compa
Monongahela Power Compa
Pennsylvania Power Compa
Florida Power & Light Co
Pennsylvania Electric Company
Gulf States Utilities Company
Detroit Edison Compa

Keep 'em up and you'll keep your up-keep down.

What's an insulator cost?

Initially a few pennies per year. What does it cost to replace an insulator? Look at your own cost records. It's evident it isn't the initial price that determines the final cost.

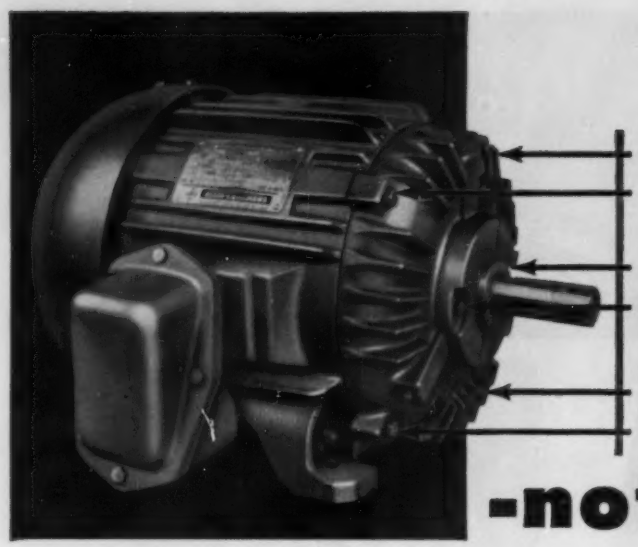
Leading utility service records prove it's the QUALITY and STAMINA built into each PORCELAIN PRODUCTS insulator that guarantees low final cost through years of trouble-free service. You too can "*keep-'em-up*" and enjoy these low costs by specifying Porcelain Products insulators when planning your transmission lines.

Want proof? Our representative will be glad to call and explain what our quality controls mean to you in terms of final cost.

PP INC

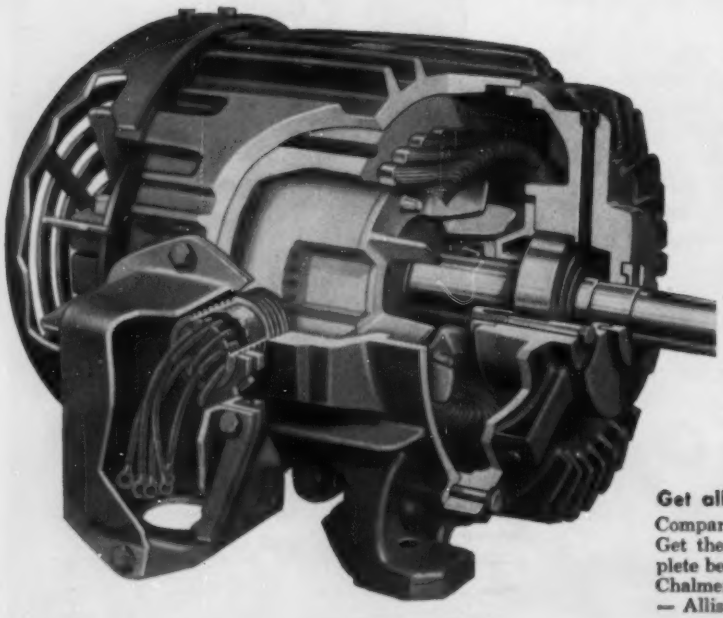
Porcelain Products, Inc.

PARKERSBURG, WEST VIRGINIA



It takes Six Bolts -not just four

to give full bearing protection for greater motor performance



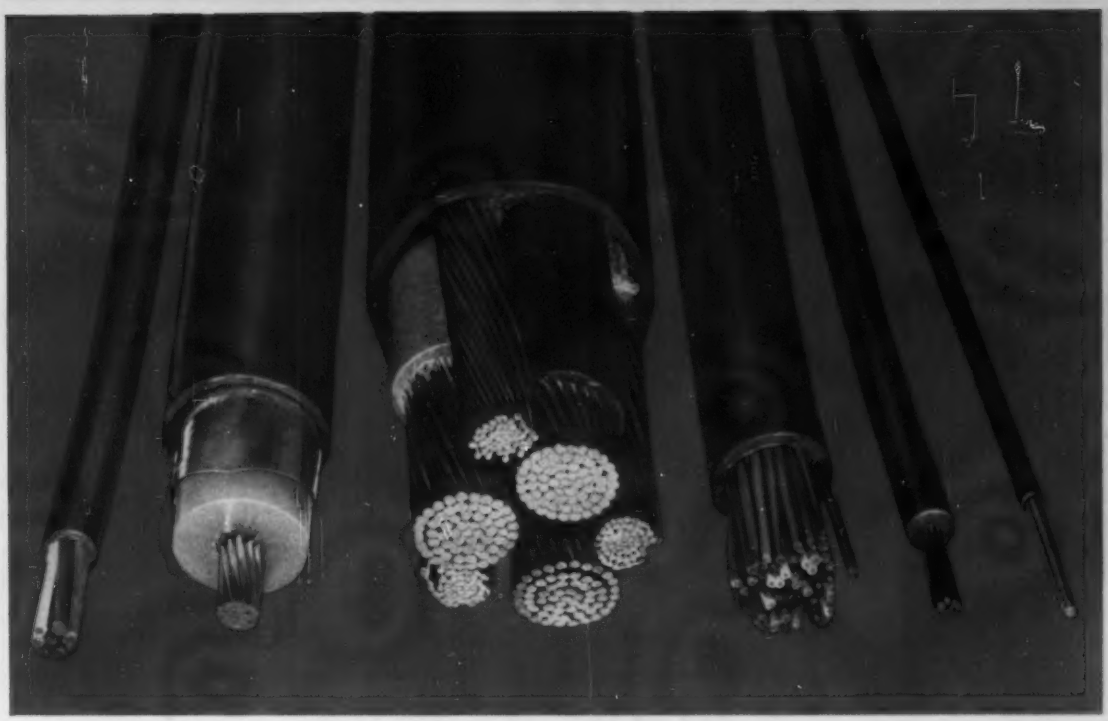
THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.

Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS A-4540



Know the family of ALATHON® polyethylene resins for insulation and jacketing materials

- ✓ *Higher-temperature ceiling*
- ✓ *Lower-temperature floor*
- ✓ *Greater toughness*
- ✓ *Longer weather resistance*
- ✓ *Low dielectric loss*
- ✓ *Low water absorption*

There is a difference in polyethylenes—

specify **ALATHON®**
polyethylene resin

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Your copper or aluminum conductors have the very best protection when covered with one of the family of "Alathon" polyethylene resins. Insulation and jacketings of Du Pont "Alathon" have outstanding dielectric properties. Linemen find wire jacketed with "Alathon" easy to handle, lightweight, and pliable.

The heat resistance of "Alathon" is superior to any other polyethylene on the market. Tough, weather-resistant insulation and jacketing of Du Pont "Alathon" assures long service life.

For additional information, clip and mail the coupon below.

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 331, Du Pont Building, Wilmington 98, Delaware

Please send me complete information on Du Pont "Alathon" polyethylene resins. I am interested in evaluating these materials for

_____

Name_____

Position_____

Firm Name_____

Street Address_____

City_____ State_____

Type of Business_____

"Like finding an extra pair of hands..."

If your Engineering Department is overloaded or understaffed . . . working with Electrical Testing Laboratories, Inc. is like finding an extra pair of hands.

Many companies have found that by delegating some of the engineering testing load to E.T.L., they have more engineering time available for projects requiring intimate, specialized knowledge of their own operations. Many phases of testing concerned with product research and development can be handled by E.T.L. All E.T.L. services are performed in strictest confidence.

Another area of relief through use of E.T.L. service is in materials acceptance or qualification testing performed in accordance with designated specifications. This may be done at headquarters in New York, or under certain circumstances, in your plant, or elsewhere in the country.

There are many points in favor of using E.T.L. trained engineering personnel and its extensive laboratory facilities to supplement your own. We will be glad to discuss them with you on request.

Know by ETL *Test*

A background of 57 years of testing experience for industry is at your service.

ELECTRICAL TESTING LABORATORIES, INC.

2 East End Avenue at 79th St., New York 21, N. Y. · BUtterfield 8-2600

ELECTRICAL • PHYSICAL • CHEMICAL ◆ TESTING • INSPECTION • CERTIFICATION

It's something we take for granted

"Electricity," said Mr. Jones, "is one thing I have never understood."

"What's hard to understand about it?" said Mrs. Jones. "All you have to do is flip a switch."

We may smile at the lady's statement but it points up the fact that electric service is so good, we take it for granted.

This high standard of service didn't just happen. Utilities have invested billions of dollars in modern plant facilities for generating, transmission and distribution. And their highly-skilled personnel all work together to make electricity as reliable as is humanly possible.

We are proud that Copperweld* Products are playing an important part in this stupendous job. Through the years these products have performed so well that today, when Copperweld materials are specified, their reliability also is "something we take for granted."

*Trade Mark

COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION, Glassport, Pa.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

Copperweld
TRADE MARK
PRODUCTS
1955
-our 40th year
POWER CONDUCTORS • GUY AND MESSENGER STRAND • GROUND RODS AND CLAMPS • OVERHEAD GROUND WIRE • COUNTERPOISE WIRE • ANCHOR RODS

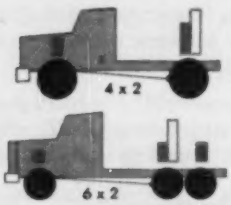
"More than just a Truck—" you want in a

This basic unit of heavy-duty driving power opens up a whole new concept of on-the-job achievement...designed to out-perform mass produced, mass marketed trucks on the basis of extra power, dependability and economy of operation.

More of Everything in these Improved Additions *with Advanced...*

Advanced Math-Matic Design – in every feature of FWD—correctly proportions power to weight on front and rear axles . . . making every pound of load help haul itself! Each wheel's load only makes it grip harder, turning every ounce of power into more controllable traction, greater steering safety.

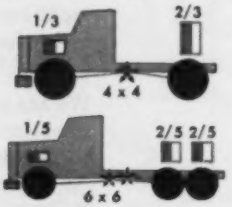
ORDINARY REAR-WHEEL-DRIVE TRUCKS



Note how power is wastefully concentrated on one axle.

■ Proportion of weight on each axle

FWD WITH ADVANCED MATH-MATIC DESIGN



Note how power is correctly proportioned to weight distribution.

P Proportion of power on each axle

BUILDERS OF AMERICA'S FWD FOREMOST HEAVY-DUTY TRUCKS

MATH • MATIC DESIGN

WRITE TODAY . . . for illustrated product folders on units in the weight category you normally use. Four and six wheel drive units from 14,500 to 60,000 lbs. G.V.W.

We'll also send your free copy of "The Truck That Went to College"—report of 7 years' truck research by the University of Wisconsin's College of Engineering.

THE FOUR WHEEL DRIVE AUTO COMPANY

yet...more of Everything Truck!

- ★ Higher power-weight ratio!
- ★ Up to 82% greater tractive ability!
- ★ 30 to 37% longer tire life!
- ★ Greatest operating safety!
- ★ Greater load-carrying capacity!
- ★ Better weight distribution!
- ★ At no increase in fuel consumption!

CUSTOM-ENGINEERED! More Driving Power Less Dead Weight thru Stronger, Lighter Alloy Steels and Advanced Math-Matic Design!

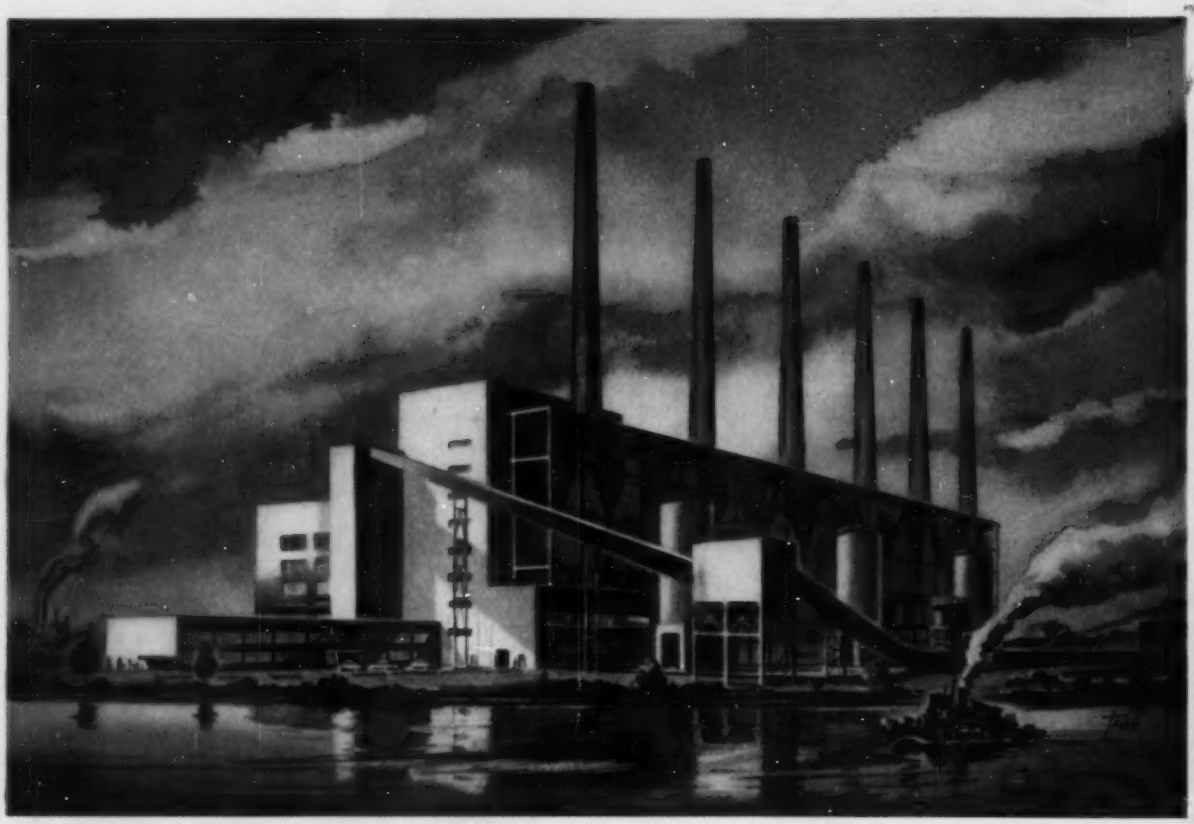
Now—more than ever—more of the weight is working weight in FWDs. New, lighter, tougher steels cut dead weight, increase FWD load-carrying capacity by improving power-weight ratios.

WHAT'S YOUR HEAVY-DUTY TRUCKING PROBLEM?
Along our nation's highways, throughout the world's oil fields, over the rugged terrain utility crews must travel ...anywhere there's tough, heavy work to be done—you'll find FWDs shouldering more than their share of heavy-duty problems. That's what FWDs are for... the tough jobs in tough places, where conventional trucks can't even travel.

CLINTONVILLE, WISCONSIN, *Canadian Factory* KITCHENER, ONTARIO

...and now

2,000,000



Reddy Kilowatt

3,250,000 KILOWATTS BY 1957

When the new unit goes into operation, capacity of the Detroit Edison system will total three and a quarter million kilowatts—more than double that of ten years ago. This will be the third unit to be installed at River Rouge—the other two, with a capacity of 260,000 kw each, will go on line in 1956.

** Trade mark character used by permission of Reddy Kilowatt, Inc.*

pounds per hour!

Detroit Edison to make power generation history at new River Rouge Plant . . . with a tradition-shattering high-pressure turbine of 300,000 kw capacity, served by a Foster Wheeler Steam Generator, the largest in the world!

IT TAKES COURAGE and foresight to break with tradition—to plan and execute a power project which far surpasses anything ever done before. But the break has been made and a thrilling new chapter in power plant history is now being written. It's the story of Detroit Edison's River Rouge Plant.

Here, late in 1957, the largest steam turbine-generator in the world will go into operation. Rated at 300,000 kw, it will set completely new standards of efficiency and economy — producing a kilowatt of electricity for less than three fourths of a pound of coal!

Steam for the giant turbine will be supplied by a single Foster Wheeler steam generator with a capacity of two million pounds per hour at 2450 psi pressure and 1050 F at the superheater outlet. Reheat facilities will resuperheat the steam to 1000 F after it has passed through the initial stages of the turbine. This, the largest single steam generator ever to be built, represents a great forward step in power plant engineering.

The awarding of this record-making order is therefore a gratifying vote of *confidence* from Detroit Edison. Past achievements show that this confidence is well placed. With more than fifty years of experience in steam generation, and the finest modern manufacturing facilities in three large plants, Foster Wheeler welcomes the opportunity to help Detroit Edison make history at River Rouge. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

What's worth more to an electric utility . . .

PRIDE OR

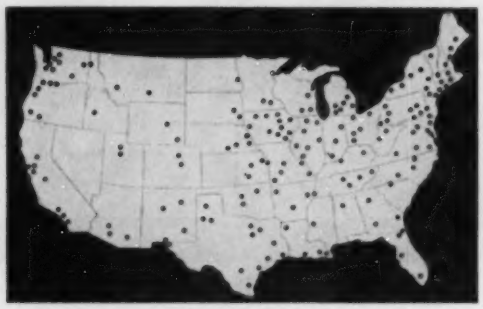
Kaiser Aluminum services available to you:

FIELD SERVICE—Experienced Kaiser Aluminum field engineers are available to work with your crews on stringing jobs; demonstrate ways to speed installations and cut costs.

ENGINEERING SERVICE—Kaiser Aluminum engineers and specialists work with you in power system planning and design; furnish technical information such as stringing sag tables and sag-and-tension charts on request; help keep you up to date on latest construction techniques; help solve installation problems.

DELIVERY SERVICE—Kaiser Aluminum's reputation for on-time delivery is unsurpassed in the industry.

LABORATORY SERVICE—Kaiser Aluminum laboratories continually evaluate accessories, enabling us to suggest accessories and installation procedures designed to give you maximum service and economy. They offer assistance on fundamental research. They also continually check Kaiser Aluminum conductor to insure consistent high quality.



KAISER ALUMINUM DISTRIBUTOR COVERAGE is the best in the country. There's a distributor conveniently located to serve you, wherever you are. His many services include: large stocks of Kaiser Aluminum conductor, fast delivery to help reduce your inventory, up-to-the-minute information to help keep you abreast of latest developments, friendly, personal attention on any size order.

You get these complete services at no extra cost when you specify Kaiser Aluminum conductor.

PERFORMANCE ?

SURE, WE'RE PROUD of our past history and accomplishments, as most companies are.

But we think you are more interested in our *everyday performance*—today, now!—that can help you do a better job at lower cost.

We mean the kind of performance that causes our customers to write:

"... wonderful cooperation!"

"... you've done the impossible for us!"

"... can't beat Kaiser Aluminum service!"

"You are always willing to help out!"

"... splendid service and quality!"

"Kaiser Aluminum has never let us down!"

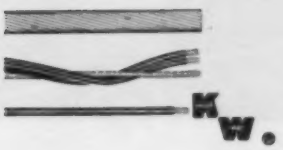
There are hundreds of commendations in our files like these—testifying that Kaiser Aluminum's *customer-minded* service is unsurpassed in the industry!

If it's *performance* you're looking for, day after day, we invite you to prove to yourself—with your next order—that Kaiser Aluminum is the one best place to get it!

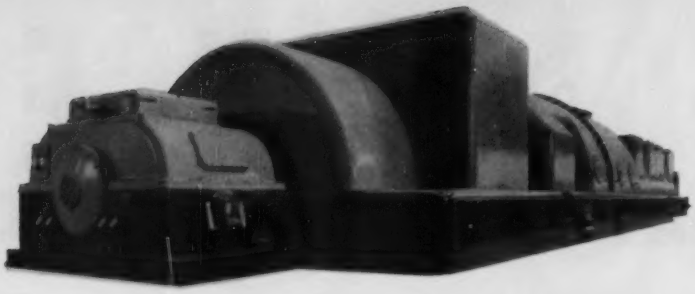
For immediate attention, contact the Kaiser Aluminum sales office listed in your telephone directory or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. ***General Sales Office*, Palmolive Bldg., Chicago 11, Illinois**; *Executive Office*, Kaiser Bldg., Oakland 12, Calif.

Kaiser Aluminum

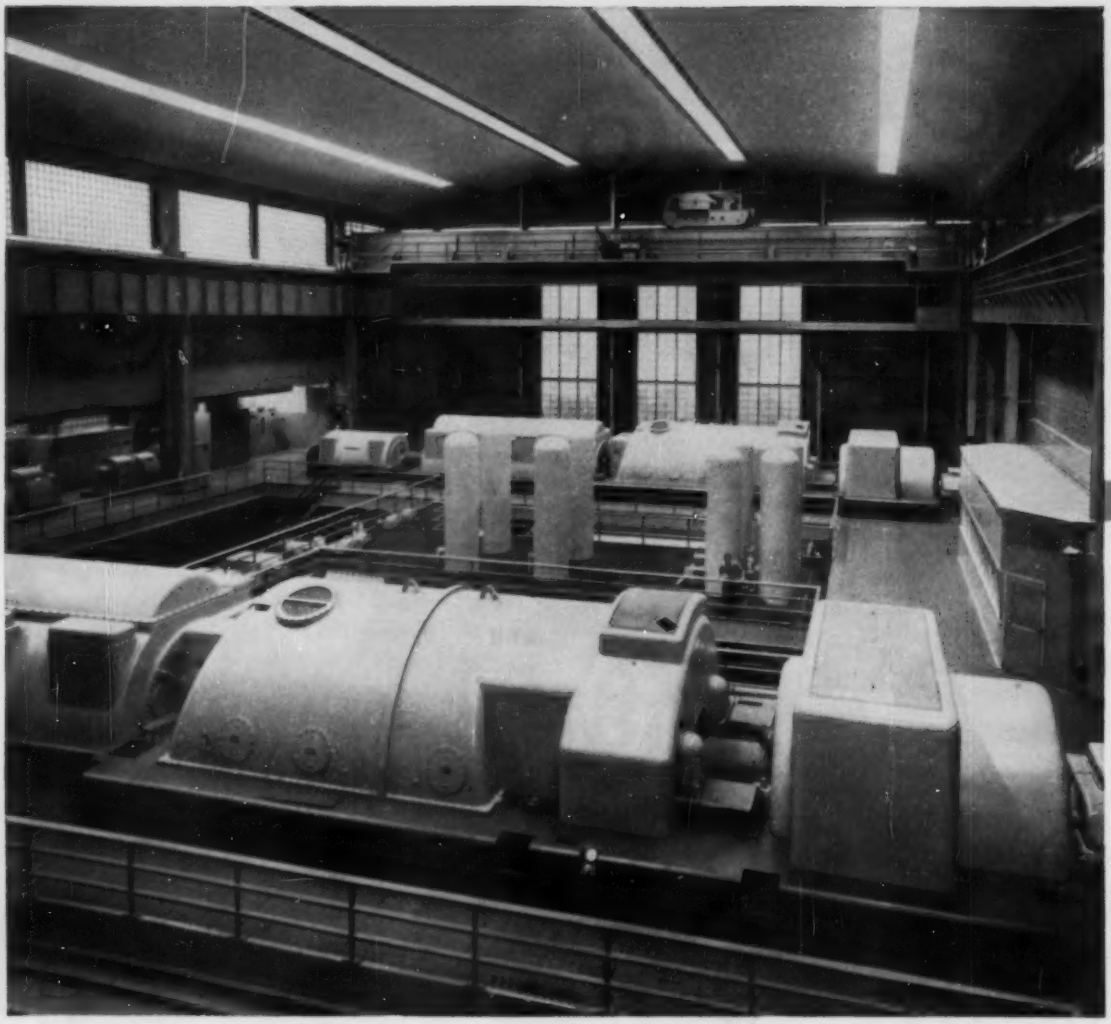
setting the pace—in growth, quality and service



POLYETHYLENE & NEOPRENE WEATHERPROOF • TRIPLEX
QUADRUPLEX & DUPLEX • ACSR • ALL ALUMINUM CONDUCTOR
RECTANGULAR, SOLID ROUND AND TUBULAR BUS



Hottest



Two General Electric 145,000 Kw tandem-compound, triple-flow turbine-generator units at the New Kearny Generating Station of Public Service Electric and Gas Company (New Jersey). They are designed for steam conditions of 2350 psig; 1100 F initial, and 1050 F reheat. At the top is a close-up of one of these high-temperature turbines at the New Kearny Generating Station. These two units produce enough electric power to supply a city of 800,000 people.

support

Junior

Achievement

Junior Achievement Week
January 30-
February 5, 1955

steam turbines in the U.S. get effective, long-lasting lubrication with

GULFCREST OIL

Driven by steam so hot that the stainless steel pipes carrying it glow dark red and with their huge turbine rotors spinning at 3600 rpm, this country's hottest steam turbines require safe, long-lasting lubrication.

Entrusted with the vital job of providing this kind of lubrication is Gulfcrest—the oil that is super-refined by Gulf's exclusive Alchlor Process.

Gulfcrest Oil's unmatched record of outstanding performance in every type and make of steam turbo-generator is a guarantee of efficient protection for the nation's hottest units for many years to come.

The next time you fill a turbine system, make it a fill for the most effective, longest-lasting protection. Specify Gulfcrest—the world's finest turbine oil. Call your nearest Gulf office today and have an experienced Gulf Sales Engineer recommend the proper grade.

GULF OIL CORPORATION

GULF REFINING COMPANY

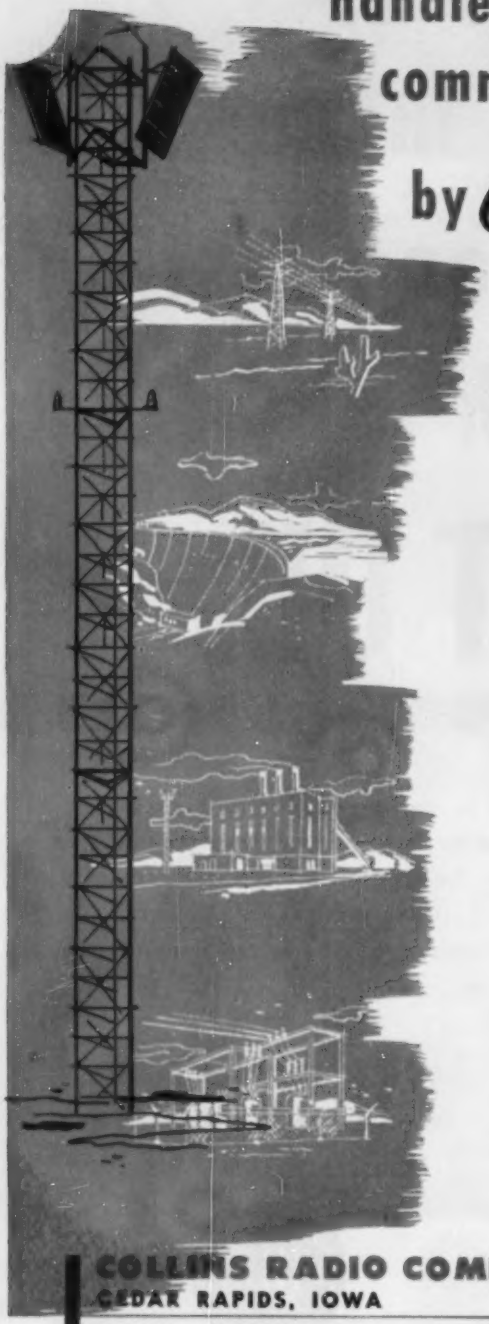
1822 Gulf Building, Pittsburgh 30, Pa.

GULF

The finest petroleum products for your every need

increase operating area, handle greater loads, through communication and control

by *Collins* MICROWAVE



Collins microwave equipment offers an extremely reliable, simple-to-maintain system for high speed relaying, system telemetering, supervisory control and voice functions. Additional channels or groups of channels may be added as needed at a much lower cost than that required for carrier-current or wire line installation. Frequency division multiplexing utilizes mechanical filters in a bi-lateral single sideband suppressed carrier system. This method allows a maximum amount of information to be handled economically with a minimum of equipment. Unit construction allows installation flexibility to meet a user's specific needs.

SEVEN MORE REASONS FOR COLLINS

- Tubeless power supplies employ magnetic amplifiers for regulation
- Rugged, permanently tuned mechanical filters for selectivity
- Up to 16 teletype, relaying, telemetering or supervisory control functions on each channel
- Only five tube types, including reflex klystron
- Built-in metering and control elements to facilitate routine maintenance
- Designed for reliable unattended operation, optional automatic switchover to standby equipment with fault alarm
- Facilities may be expanded at minimum cost

The services of Collins microwave engineering staff are available for assistance in evaluating, planning or installing your microwave equipment.

Write Microwave Dept. B for descriptive literature.

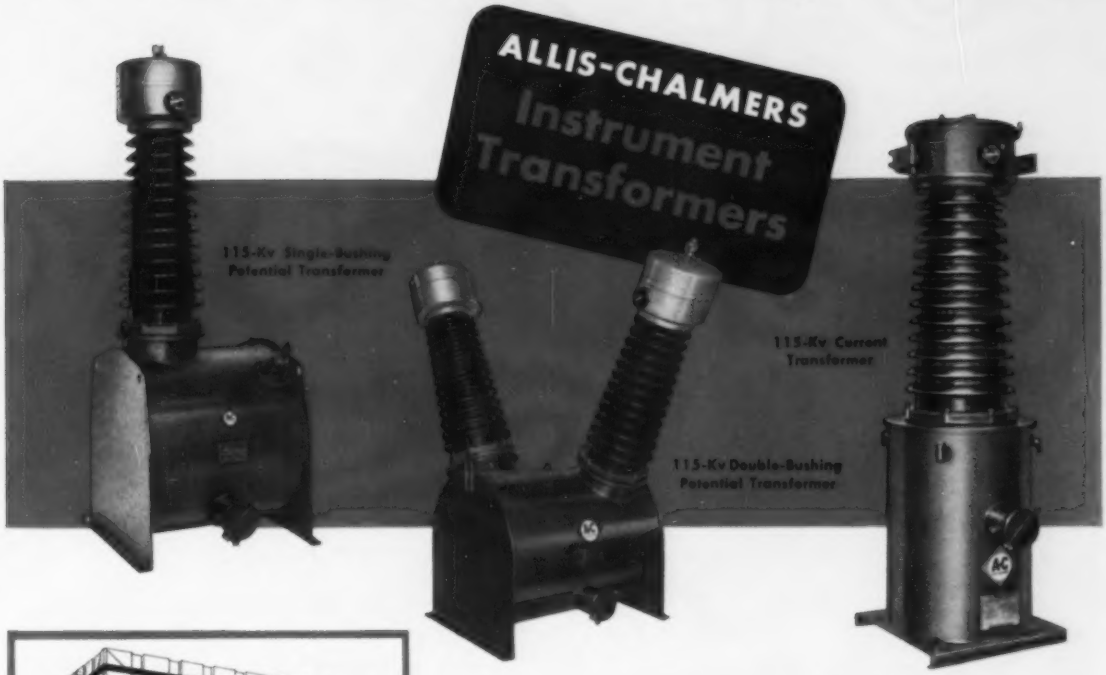
COLLINS RADIO COMPANY
CEDAR RAPIDS, IOWA

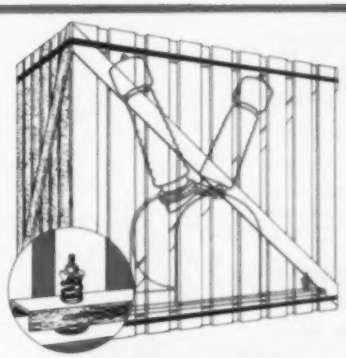
261 Madison Avenue, NEW YORK 16, NEW YORK
1200 18th Street N.W., WASHINGTON, D. C.
1930 Hi-Line Drive, DALLAS 2, TEXAS
2700 W. Olive Avenue, BURBANK, CALIFORNIA

COLLINS RADIO COMPANY OF CANADA, LTD.
74 Sparks Street, OTTAWA, ONTARIO

COLLINS

New, compact, lightweight design extended to higher voltage classes





Shipped on Springs for Maximum Protection

During shipment, each Allis-Chalmers large current or potential transformer floats on springs in a specially designed crate. Result: maximum protection against damage en route. Assurance that you will get a unit in top condition ready for service.

NOW YOU CAN TAKE ADVANTAGE of Allis-Chalmers new designs for oil-insulated outdoor current and potential transformers for circuits through 115 kv. They take less space, require less foundation or mounting structure than older designs. They are easier to handle during installation.

Corona-Free Design for Long Life

All units in the line are corona-free. They utilize solid insulation at critical points to reduce stresses and lengthen life. Extensive internal overvoltage tests have proved all voltage classes.

Sturdy Construction

Tanks are all-welded, hermetically sealed to protect insulation and oil from sludge formation. Unique bushing construction provides for an oil reservoir common to both bushing and transformer, reducing the oil requirements and cutting the size and weight.

Get more information by calling your nearby A-C district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for your copy of "PT's Are Getting Smaller." A-4544

ALLIS-CHALMERS

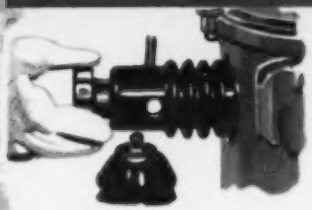
Which Distribution

A-C
ALLIS CHALMERS

ALLIS-

Transformer Is Best?

Check these
6 FEATURES
...then decide for yourself



NEW HIGH VOLTAGE SIDEWALL BUSHING

Simplifies installation; assures reliability. No more splicing because connector grips two standard conductors as large as No. 2 stranded cable at same time. Safety-designed hand-knob can't be unintentionally removed, positively protects against touching "hot" parts. Use either copper or aluminum conductor. Serrated ram prevents conductor twisting or slipping. Follow-up spring maintains positive contact pressure. No metal-to-porcelain contact at any point. Retained Corprene gaskets. Simplified bushing cable connection to terminal board makes maintenance easy.

NEW LOW VOLTAGE BUSHING

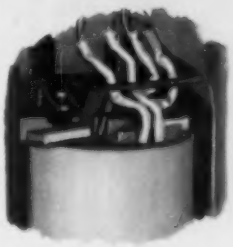
Double key design gives positive protection against rotation, eliminating a major possibility of internal short circuit and maintaining effectiveness of seal. Connector stud is keyed to bushing porcelain. Bushing is keyed to tank wall. Connector and stud are one piece. Corprene gaskets are fully retained, are compressed without twist or shear. Tinned clamp-type connectors permit use of either copper or aluminum.

NEW TANK AND COVER DESIGN

Machine welding throughout. Tapped lugs welded to tank surface so that internal thread is not exposed to damage. Tank bottom is recessed with straight wall inside and out — no place for condensation or water to collect. Cover and tank have horizontal gasket surface to assure proper compression of gasket with no possibility of shear. Gasket is fully retained. Cover clamps are captive, will not drop to ground when loosened. All tanks are pressure-tested at 50 psi.

NEW COIL SUPPORTS

Coils are locked firmly in position with adjustable-type coil supports. Pad under support distributes pressure evenly. Pads are specially compounded alkyd polyester impregnated glass fiber for strength.

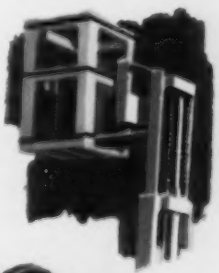


NEW HOT SPRAY PAINT PROCESS

Allis-Chalmers exclusive hot spray paint process assures maximum protection under all conditions because it puts paint, not solvent, on transformers. As a result, you get an even flow of high content, specially developed alkyd resin enamel that provides a smooth surface with high gloss and thorough coverage.

NEW SHIPPING CRATE IS RE-USABLE PALLET

Now Allis-Chalmers distribution transformers are shipped in a pallet-base crate that simplifies storage and provides a convenient pallet usable on other materials after transformer is uncrated.



SEE FOR YOURSELF

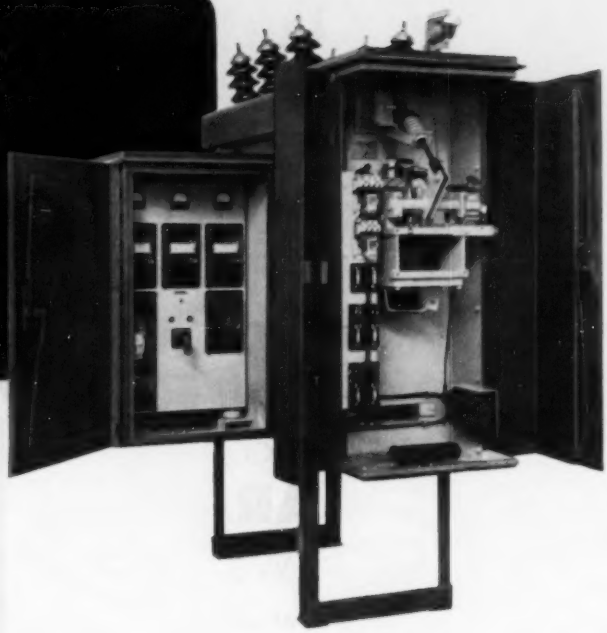
All these features and more are conveniently, graphically explained and demonstrated in the "Allis-Chalmers Visualizer." Call your nearby A-C district office and ask to see it. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for more information.

A-4531

CHALMERS

Get the breaker with these PLUS FEATURES

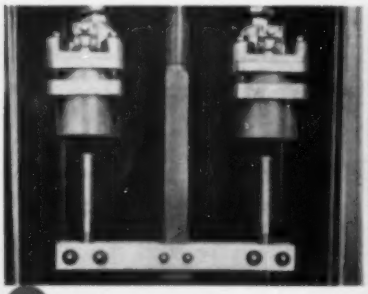
Here's increased operating convenience with high safety factor

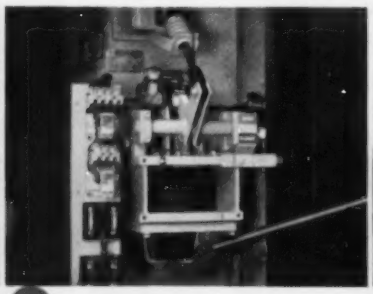


TANK PER PHASE construction — as used in large breakers — eliminates possibility of internal phase-to-phase flashover.

ACCESS FROM THREE SIDES. Side hinging of L-shaped doors allows side as well as front access to operator cabinet. Operator is high speed solenoid type — mechanically and electrically trip-free. Linkage is basically same as used on large A-C breakers.

NO FALSE OPERATION of relays. Operate the breaker — slam the door — or let the wind slam it and relays can't operate accidentally. Relay panel is in separate cabinet from operating mechanism and is 4-point mounted on shock absorbers. No hinge wiring either! Separate door in rear of cabinet provides access to back of relays.





TULIP AND BAYONET CONTACTS are self wiping, self aligning. Note also, double break per pole design and time-proved *Ruptor* interrupting device are used. Here again, Allis-Chalmers is using the same quality construction as is used on large A-C breakers.

VISIBILITY PLUS. Maintenance closing device is side operated. Man closing breaker can observe contacts and man working on them. In addition, external position indicator easily visible at a distance from front or side. Inside position indicator also provided.

NO BURIED LEADS. Simply remove three pins at bottom of fabricating wiring duct to expose bushing current transformer leads. No conduits, pipes, fittings to remove. This is just one more feature that makes this the outstanding distribution-type breaker today.

GET COMPLETE INFORMATION. Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4255

Ruptor is an Allis-Chalmers trademark.

ALLIS-CHALMERS

SPECIFY ASPLUNDH FOR

Effective and Economical
LINE CLEARANCE
and Right-of-Way work

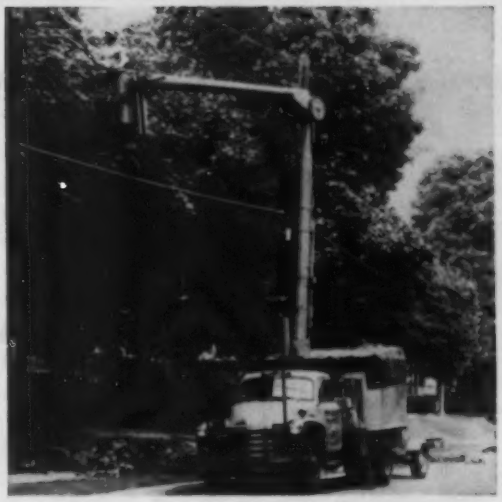
Opening of new rights-of-way, and trimming of trees and chemical brush control on existing rights-of-way are operations which should be entrusted only to *specialists*.

American public utilities which specify Asplundh for these projects are assured of:

TRAINED TREEMEN
EXPERIENCED FOREMEN
SUPERIOR SUPERVISION
GOOD PUBLIC RELATIONS
SPECIALIZED EQUIPMENT
SAFE OPERATION
COMPLETE INSURANCE
NATION-WIDE SERVICE
SOUND ADMINISTRATION

There are Asplundh Offices in twenty states; for the address of the one nearest you, write to our headquarters at 503 York Road,

JENKINTOWN, PENNSYLVANIA



Chemical Plant Power Cable Failures STOPPED

NEW INSTALLATIONS LIKE THESE...

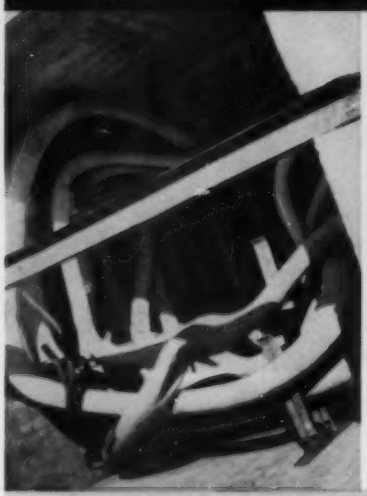


Fig. 1. Cable pit interior with cables racked, tagged, and fire-proofed. Insulation is BAKELITE Polyethylene jacketed with BAKELITE Vinyl Plastic.

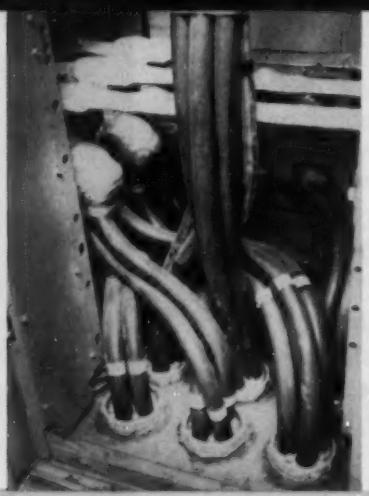


Fig. 2. Cable splices are wrapped with polyethylene tape, then covered with vinyl tape and two alternate layers of friction tape coated with waterproof sealing compound.

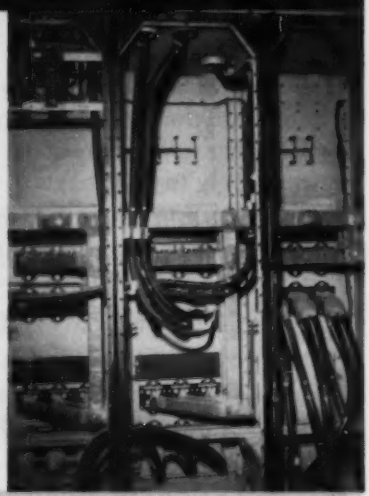


Fig. 3. Rear of control panel shows cables insulated with BAKELITE Polyethylene jacketed with Vinyl Plastic. Over 170,000 feet have now been installed at Texas City.

A tough proving ground for cable insulation is the Texas City plant of Carbide and Carbon Chemicals Co., a Division of Union Carbide and Carbon Corporation. That's why this plant has used only cable insulated with BAKELITE Brand Polyethylene jacketed with BAKELITE Brand Vinyl Plastic in the six years it has been available.

In one instance, cable insulated with BAKELITE Polyethylene was installed after some accidental spillage of a chlorinated hydrocarbon ate through a 4-in. fiber duct encased in reinforced concrete. The old insulation had been literally dissolved (fig. 4). Even though some of the chemical still remained in the duct, the new installation has served without failure for four years.

Another breakdown occurred when air was circulated through certain conduits to prevent overheating. It contained some oil fumes that caused complete

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

The term BAKELITE and the Trefoil symbol are registered trademarks of U C.C.

with insulation of BAKELITE Polyethylene and jacketing of BAKELITE Vinyl Plastic

REPLACE OLD FAILURES LIKE THESE:

Fig. 4. Reinforced concrete encased fiber duct after attack by ethylene dichloride. Old cable insulation was destroyed. BAKELITE Polyethylene has served without failure.

Fig. 5. Oil vapor was present in air circulated through cable duct to prevent excessive heating. It caused complete breakdown of conventional insulating material, as shown here.

Fig. 6. Old insulating materials disintegrated when oils came into contact with the cables. Standard transformer oil, "Pyranol," and ethylene dichloride caused damage like this.

deterioration of the rubber-type compound covering the cable (fig. 5). At another point, high-alkaline water seeped into the duct run, corroding the lead sheath and penetrating to the conductors.

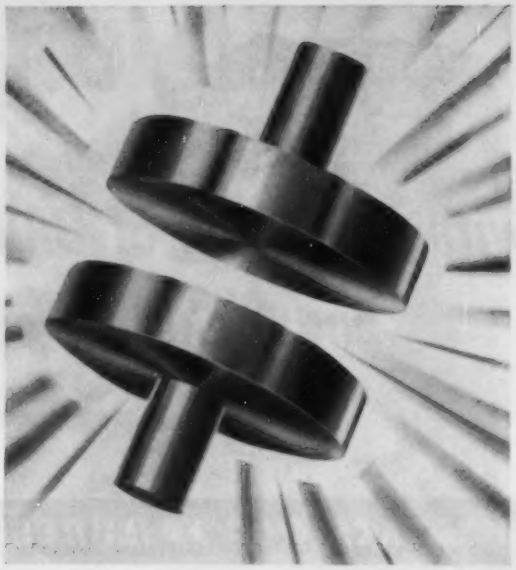
In contrast, insulation of BAKELITE Polyethylene and jacketing of BAKELITE Vinyl Plastic have proved themselves with years of trouble-free service. Write Dept. AU-63 for KABELITEMS No. 54 which describes the advantages and applications of these materials.

BAKELITE BRAND PLASTICS

Are the contacts you use

GOOD ENOUGH...

or TOO GOOD ?



The answer to this question can make an important difference in the performance and cost of your product. If your contacts do not measure up to their intended job, they can seriously detract from the satisfactory operation, freedom from maintenance, and acceptance of the equipment in which they are used. If the contacts are too good, or over-designed, they add uselessly to the cost of the finished equipment.

Designing a contact for a specific job, however, is a real engineering problem. It involves consideration of many electrical, mechanical and environmental factors. The current and voltage in the interrupted circuit . . . the type of load . . . the expected service life . . . contact gap . . . contact pressure . . . ambient temperature and atmosphere . . . these and many other aspects of the problem demand evaluation.

From Mallory, you can be *sure* of getting contacts that will perform correctly in your application . . . at a price that fits your production budget.

THE RIGHT MATERIALS. The extensive selection of contact materials developed by Mallory's metallurgical research includes an unequalled variety of specialized materials.

THE RIGHT DESIGN. Mallory engineers apply to your problem the knowledge gained in thirty years of contact experience. Standard designs are recommended wherever possible for standard requirements . . . and for special needs, custom-fitted designs are developed.

THE RIGHT PRICE. Mallory cost-saving design assures top economy consistent with service requirements. Further economies are often realized by having Mallory fabricate your complete contact assemblies for you.

A Mallory engineer will be glad to discuss your particular problem. Write or call today for a consultation, and for a copy of the Mallory Contact Catalog.

Expect more...
Get more from MALLORY

In Canada made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario

Serving Industry with These Products:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA

Overload indicator is quickly and easily reset by simply pushing indicating light socket up.

The L-M Transformer Overload Indicator is easily installed on transformers in service. It is secured to the transformer tank wall by a stainless-steel zigzag wire wrapped around the tank.

Maintain High Service Continuity With

L-M's New Ambient-Temperature-Compensated Overload Indicator

Accurate, economical, easy to install on transformers in service; measures tank wall temperature; provides continuous overload check without interrupting service.

W. H. ENGLAND
Application Engineer
Protective Equipment Division
Line Material Company

Line Material engineers have recognized the need for an accurate yet economical overload indicator to eliminate the costly and laborious task now required for load checking. In addition, conventional type transformers with overload indicators will eliminate the costly expense of resetting the secondary breaker on protected transformers.

We have therefore developed an indicator that assures positive overload indication, amply meets thermal, mechanical, and economical requirements, and does not interrupt service to customers.

The overload indicator is a tool which you can utilize extensively to obtain and maintain a high continuity of service. It will enable you to keep your hand on the pulse of your distribution load.

Compensates for Ambient Temperature

The device indicates thermal overloads accurately. It measures tank wall temperature (a function of top oil and hot-spot temperatures), and makes proper allowance in transformer loading for variations in ambient temperature.

The indicator is easily installed on transformers in service. It is secured to the transformer tank wall by a stainless-steel zigzag wire wrapped around the tank. On new L-M Round-Wound® transformers from the factory, the indicator is attached to a strap permanently welded to the transformer tank.

Illuminated Target

When the indicator reflects a transformer overload condition, a tube target drops, exposing and energizing a red light. The light is readily discernible in daylight as well as at night.

The indicator target is also available wrapped with reflecting tape, which is exceptionally brilliant and easily distinguished. This indicator without the red light does not require an electrical connection to the transformer.

Low Cost; Pays for Itself

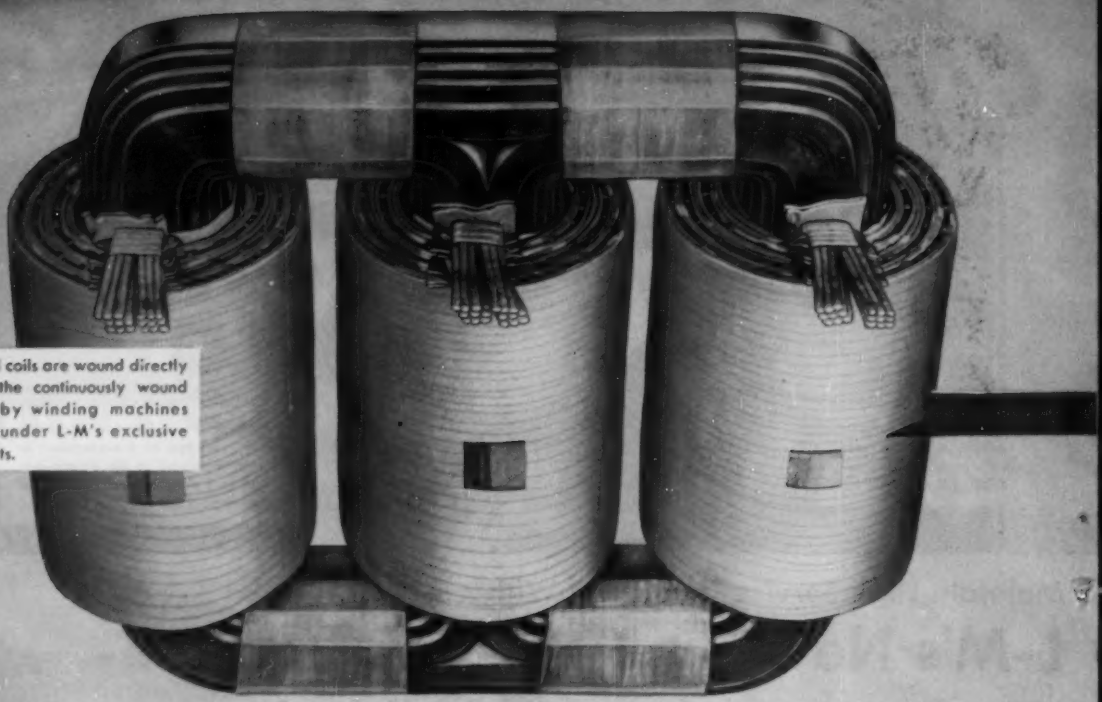
The cost is low. The indicator will quickly pay for itself through reduction in transformer burnouts and elimination of load checks.

Get information on the L-M overload indicator today. Ask the L-M Field Engineer for bulletins and complete information; or write Line Material Company, Protective Equipment Division, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Illuminated target affords positive overload indication which is easily seen during the day or night.

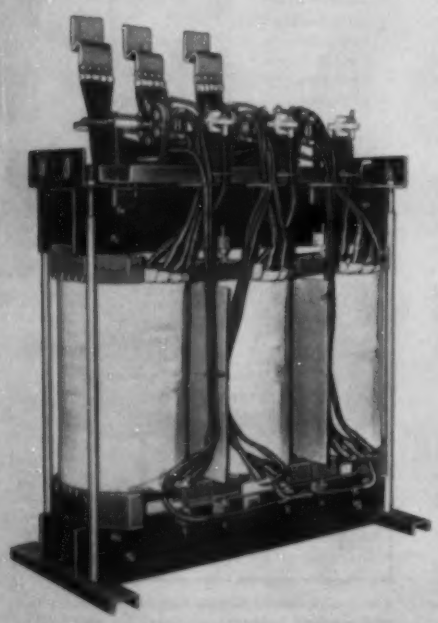
L-M Transformer Overload Indicator in normal and overload indicating positions. The metallic tank wall heat receiver is semi V-shaped to fit on any size or shape of tank.

LM LINE MATERIAL Protective Equipment

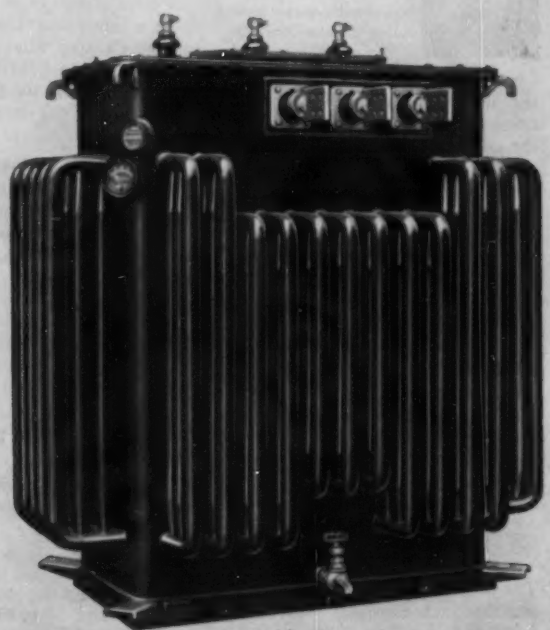


Round coils are wound directly onto the continuously wound core by winding machines built under L-M's exclusive patents.

L-M Announces New Uni-Wound℠ 3-Phase

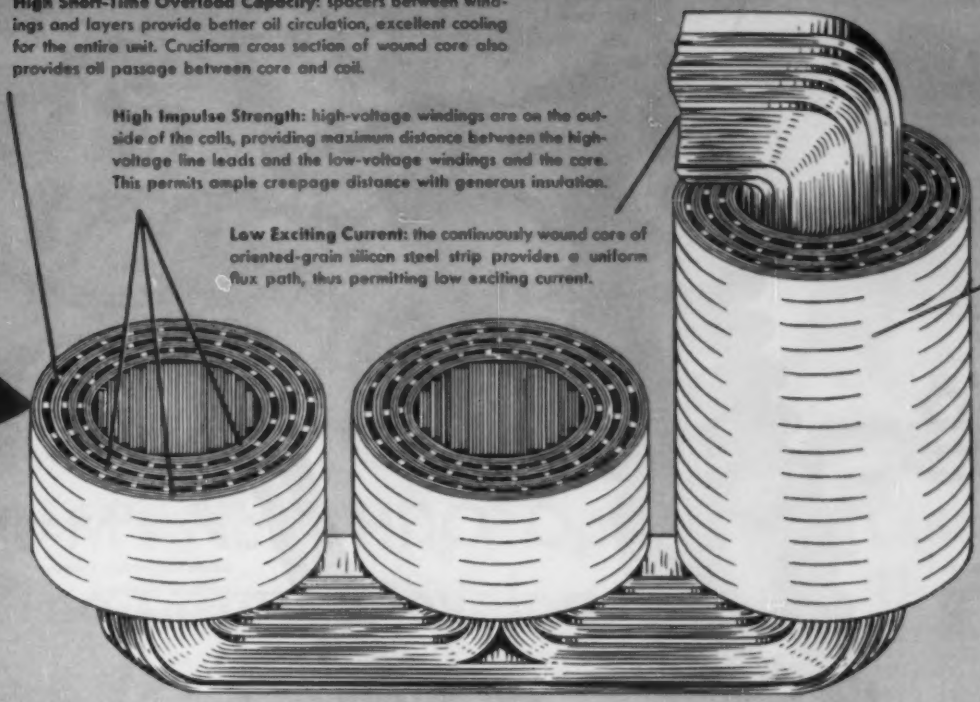


Core-coil assembly for a 500 kva Uni-Wound transformer. The sturdy core clamping frame and strong blocking contribute to high short-circuit strength.



Completed 500 kva Uni-Wound 3-phase transformer. The unit is smaller, shorter, and lighter than L-M's previous type. The transformer provides all the well-known advantages of L-M's single-phase Round-Wound transformers.

"Uni-Wound" and "Tri-Wound" are Line Material Company trade-marks.


High Short-Time Overload Capacity: spacers between windings and layers provide better oil circulation, excellent cooling for the entire unit. Cruciform cross section of wound core also provides oil passage between core and coil.
High Impulse Strength: high-voltage windings are on the outside of the coils, providing maximum distance between the high-voltage line leads and the low-voltage windings and the core. This permits ample creepage distance with generous insulation.
Low Exciting Current: the continuously wound core of oriented-grain silicon steel strip provides a uniform flux path, thus permitting low exciting current.
High Short-Circuit Strength: round coils naturally resist radial short-circuit forces without damage or distortion. Sturdy core clamps and strong blocking aid in preventing axial movement of the windings under short-circuit conditions.

Transformers in 112½ to 500 kva Sizes

Provides advantages of L-M Round-Wound® core construction in 3-phase transformers in sizes from 112½ through 500 kva. They're lighter, smaller, have improved overload capacity, high impulse level, high short-circuit strength.

By **ALVIN B. COYLE**
Manager,
Transformer Sales
Line Material Company

L-M Round-Wound construction consists of a continuously wound core, with round coils wound directly onto the core. This design has a number of advantages in improved performance and better mechanical strength.

Uni-Wound Fills Need

Now L-M engineers have developed a 3-phase transformer with all the advantages of Round-Wound construction. This is the new *Uni-Wound* transformer, which is now in production in sizes from 112½ through 500 kva, and in voltages through 13,800. In smaller 3-phase sizes L-M offers the new *Tri-Wound* transformer.

Continuously Wound Core

The Uni-Wound transformer consists of a unitary core, contihuously wound of oriented-grain silicon steel strip. The bare core is annealed after winding. Then round coils are wound directly onto the three core legs by L-M's exclusive winding process.

All Other Round-Wound Advantages

Thus all of the inherent characteristics of the single-phase Round-Wound transformer are provided in the 3-phase Uni-Wound. These advantages include:

high short-time overload capacity
uniformly high impulse strength
high short-circuit strength
low exciting current
lighter weight • smaller size

Uni-Wound Lighter, Lower

The 500 kva Uni-Wound is about 1200 pounds lighter than the stacked lamination type. The 112½ kva, 2400 volt delta Uni-Wound is about 400 pounds lighter than the 112½ kva Triplex style. These lighter weights permit single-pole mounting of sizes through 150 kva instead of the 2-pole platform construction previously required. In some sizes, the over-all height has been reduced as much as two feet, with but little increase in projected floor space.

Balanced Performance

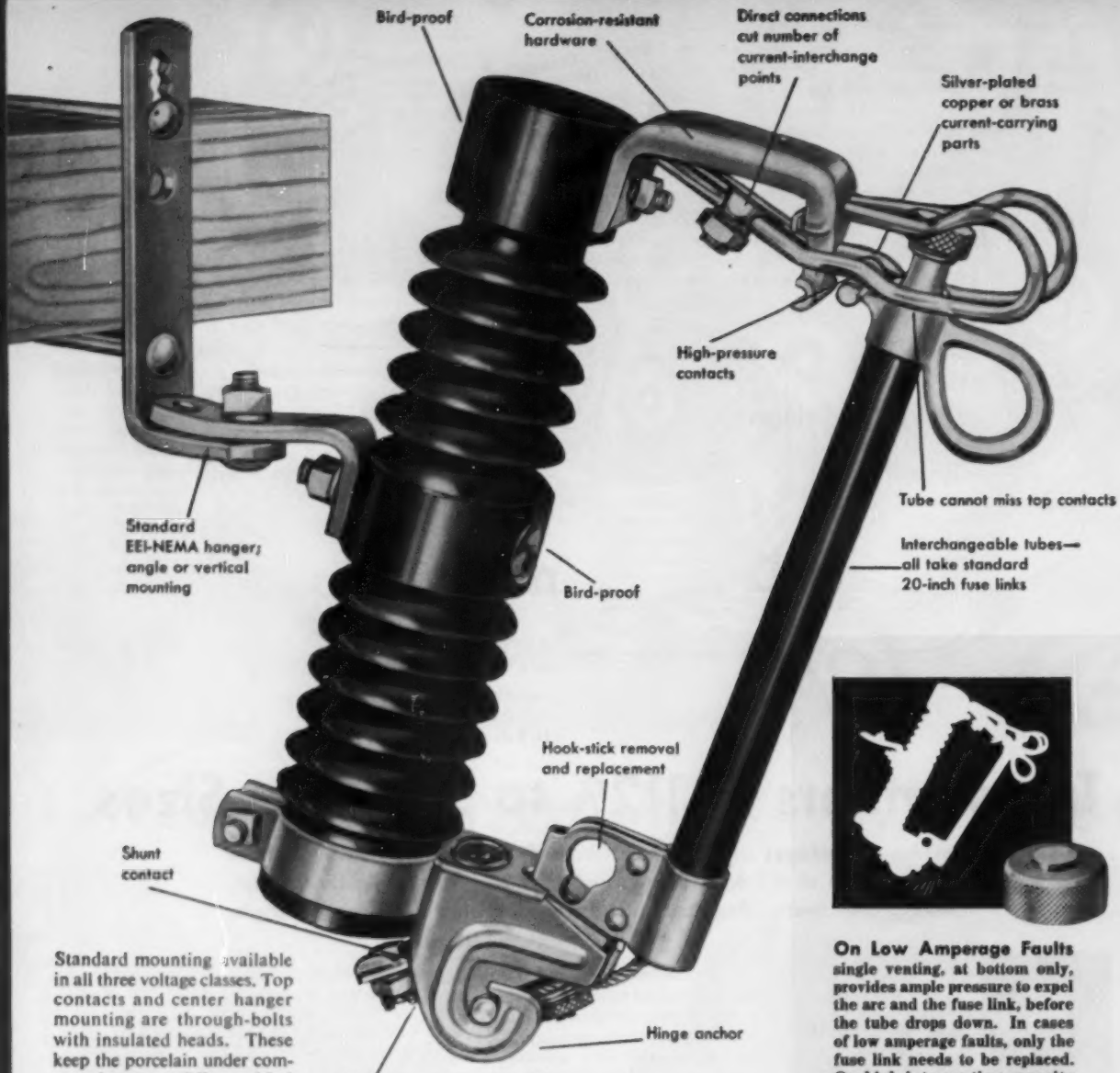
Both the physical and performance characteristics have been well balanced in the Uni-Wound 3-phase transformer design. Just as with the single-phase Round-Wound, no one characteristic has been emphasized at the expense of another. No one characteristic has been considered exclusively by itself, but only in its relationship to the over-all performance of the transformer.

Get Details on Uni-Wound Transformers

Ask the L-M Field Engineer to give you full details; or write Line Material Company, Transformer Division, Zanesville, Ohio. (Line Material Company is a McGraw Electric Company Division.)

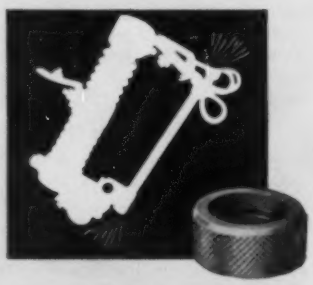
198

LINE MATERIAL Transformers


Bird-proof
Corrosion-resistant hardware
Direct connections cut number of current-interchange points
Silver-plated copper or brass current-carrying parts
High-pressure contacts
Tube cannot miss top contacts
Interchangeable tubes—all take standard 20-inch fuse links
Standard EEI-NEMA hanger; angle or vertical mounting
Bird-proof
Hook-stick removal and replacement
Shunt contact
Hinge anchor
Direct connections cut number of current-interchange points

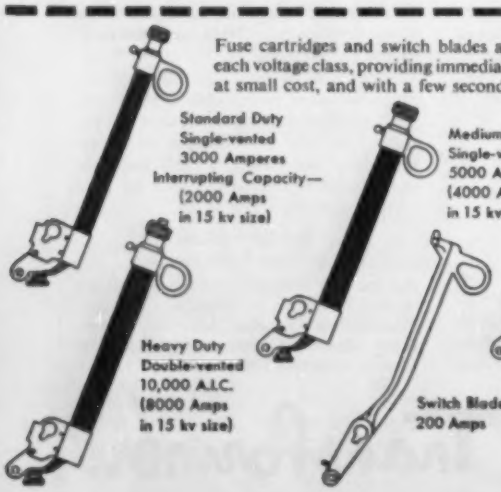
Standard mounting available in all three voltage classes. Top contacts and center hanger mounting are through-bolts with insulated heads. These keep the porcelain under compression, providing added strength and a completely bird-proof design.

On Low Amperage Faults single venting, at bottom only, provides ample pressure to expel the arc and the fuse link, before the tube drops down. In cases of low amperage faults, only the fuse link needs to be replaced. On high interrupting capacity cutouts, the expendable cap, above, right, remains intact, the same as the solid cap.

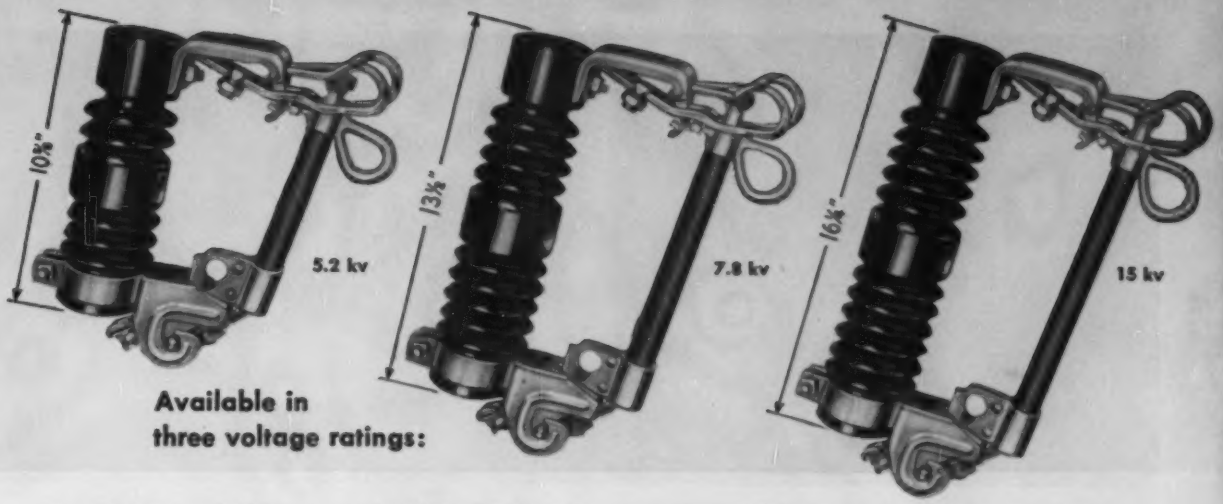


On High Amperage Faults pressure automatically opens the expendable cap at the top to provide double venting. No bursting of tubes. Gas flashover is eliminated because no cutout parts are in the path of gas discharge.

Fuse cartridges and switch blades are completely interchangeable in each voltage class, providing immediate increase in interrupting capacity at small cost, and with a few seconds work with a hook-stick.


Standard Duty Single-vented 3000 Amperes Interrupting Capacity—(2000 Amps in 15 kv size)
Medium Duty Single-vented 5000 A.I.C. (4000 Amps in 15 kv size)
Medium Duty Double-vented 6000 A.I.C. (4000 Amps in 15 kv size)
Heavy Duty Double-vented 10,000 A.I.C. (8000 Amps in 15 kv size)
Switch Blade 200 Amps

Interchangeable load-break cartridges will be available soon for each voltage class cutout. Easy pulling action will break link inside tube, and arc is cleared before tube can drop.



Available in three voltage ratings:

L-M's New "HDO" Open-Type Cutouts... The Cutout Development Of The Year!

New "HDO" 100-ampere cutouts are the simplest, most rugged, easiest to operate in the industry today. Provide high interrupting capacity, bird-proof design; heavy construction, assuring economy.

By R. W. KELLY
Application Engineer
Protective and Switching Equipment Division
Line Material Company

Here's a big new development in open-type cutouts that offers you a tremendous improvement in performance, operation, and economical long life.

The "HDO" is a big, rugged cutout. It is strong, durable. It's the easiest cutout to operate you ever saw. Complete hook-stick removal and replacement of cartridges. Bird-proof construction. Silvered current-carrying parts with few current-interchange points assure ample capacity without overheating. And it operates equally well on high and low fault currents.

Positive Pressure Control

A feature of the "HDO" is L-M's exclusive pressure-controlled expendable cap. On low faults the pressure is confined, assuring consistent, reliable arc interruption. On high faults the diaphragm in the cap opens, relieving the pressure by providing double venting.

Complete Line of Cutouts

Prices for the "HDO" cutouts are extremely reasonable, and the interchangeability feature offers desirable future economies. The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes, with a full line of cartridges in standard- and heavy-duty interrupting ratings, and a 200-ampere switch blade. All cartridges take standard 20-inch distribution fuse links.

Protection That Is Reliable

The many desirable features incorporated in L-M's "HDO" open-type cutout assure positive action, dependable service.

Completely bird-proof construction.

Current-carrying parts all silver-plated brass or copper; this prevents false outages caused by contact heating even after many years of operation.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges are designed for complete removal and replacement with a standard hook-stick.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs and designed to serve as a guide.

Corrosion-resistant, high-strength hardware has four to six times the life of mild steel.

Get Complete Information

Ask the LM Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

SIZES AND RATINGS

Cartridges	Interrupting Capacity, Amperes 5.2 kv.	7.8 kv	15 kv
Standard Duty Single Venting (Solid Cap)	3000 A.	3000 A.	2000 A.
Medium Duty Single Venting (Solid Cap)	5000	5000	4000
Medium Duty Double Venting (Expendable Cap)	6000	6000	4000
Heavy Duty Double Venting (Expendable Cap)	10,000	10,000	8000
Switch Blade	200 amperes continuous		

All cartridges and switch blades interchangeable in each voltage class.

LINE MATERIAL
fuse cutouts and fuse links

A panel of 32 tubes, supported by strongbacks, is fed into a specially adapted press where, in one operation, the tubes of the entire panel are bent.

Here at the job site the panels are carefully stacked in proper sequence which greatly facilitates handling and erecting operations.

NOW WE'RE "PREFABBING" BIG

Developed by Combustion, this new erection technique is a significant step toward reduction of boiler erection time and cost. It makes obsolete the practice of erecting large steam generating units part by part and tube by tube. Instead, by prefabricating large assemblies in the C-E shops, the number of repetitive field erection operations is appreciably reduced.

No longer need waterwall tubes be erected one by one. By prefabricating waterwall tube sections into panels, substantial savings in time and money are achieved. Panels consisting of 32 or more tubes, ranging in length between 40 and 60 ft., are shaped, packaged and shipped as units to the job site. It makes no difference if the tubes are straight or have multiple or compound bends. They can be prefabricated and shipped in panels that are convenient to handle. Even complete burners and their adjacent waterwall tubes are shipped as assemblies.

The advantages of such construction are numerous. Some of the more significant are:—

1 Shop assembled in precision jigs, the lengths of the tubes in each panel are exact and uniform.
2 Tube bending operations in the shops are accomplished much quicker and with a high degree of uniformity.
3 Loading and unloading panels on railroad cars is much faster than handling individual tubes.
4 Since panels can be properly supported and compactly packed aboard freight cars, tube damage while in transit is minimized.
5 At the job site, paneled tubes can be stored compactly and neatly, thereby reducing the amount of storage space required.
6 Properly numbered panels are easy to find and the "needle in the haystack" process of finding individual tubes is eliminated.
7 The number of hoisting operations is greatly reduced and better use can be made of the hoisting facilities.
8 Handling time, from storage yard to final position in the boiler, is much shorter.
9 Furnaces can be closed in much more quickly.

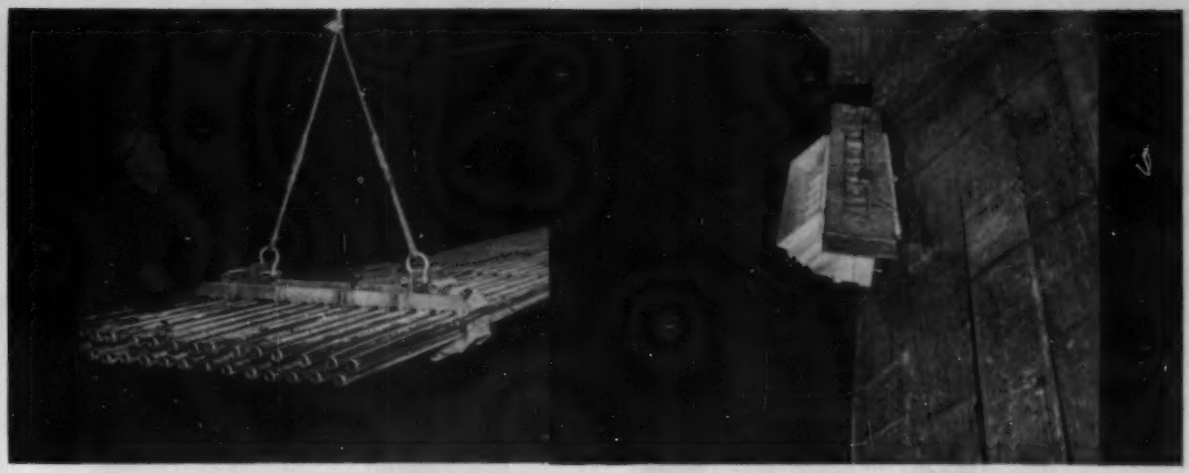
This advance in technique is still one more example of the continuing effort on the part of C-E to make good products better.

B-807

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

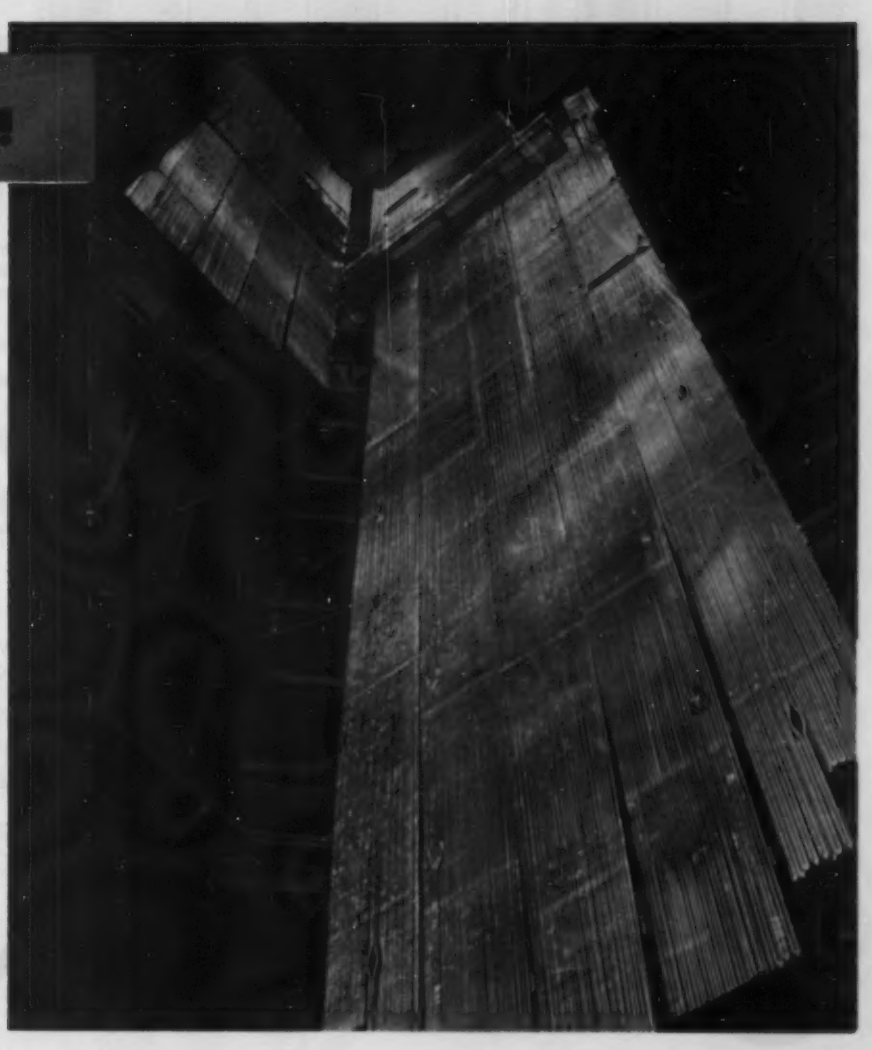
BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS AND FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE



Separating and lifting jigs are in place on a panel about to be hoisted. Note that tube ends are accurately prespaced to facilitate welding.

A corner assembly, which comprises a complete tangential burner unit with its waterwall tube panel, is raised into position.

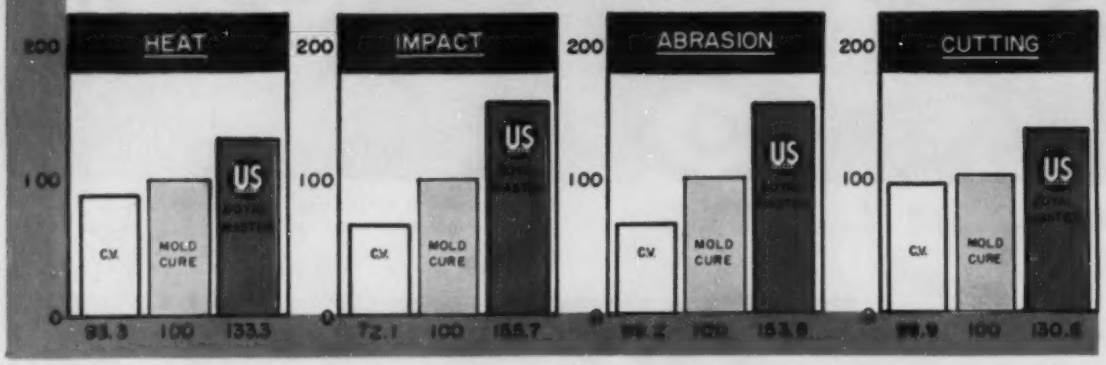
BOILERS!



Thirty separate panels comprising nearly 1000 individual tubes are now in place. Only 30 hoisting operations were required.

STARTLING

Comparative performance of portable cords related to major life factors.



New U. S. ROYAL MASTER portable cord

PROVES SUPERIOR TO ALL OTHERS IN EVERY SERVICE FACTOR!

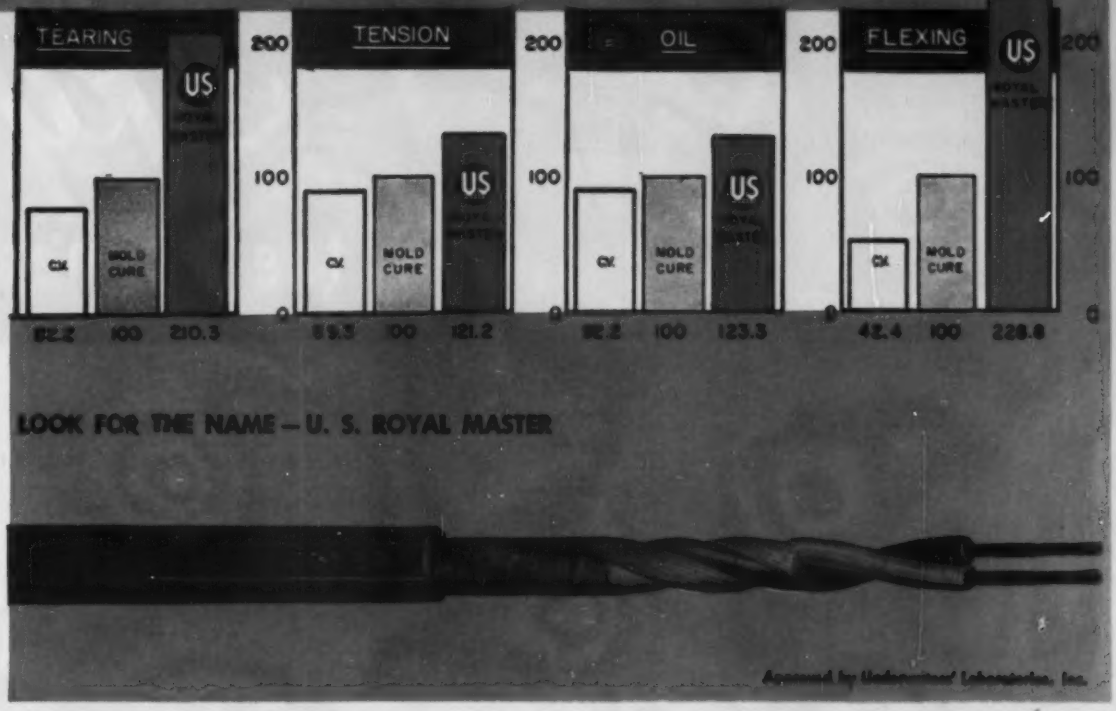
Newly developed U. S. Royal Master Cord gives almost twice the service of other molded cords — gives $1.88 value for every cord $1.00!

Life factor charts illustrate outstanding superiority of new U. S. Royal Master over the average of both the molded cords and the short-lived continuous vulcanized cords of other makes.

US RUBBER

UNITED STATES
ELECTRICAL WIRE & CABLE DEPARTMENT

EVIDENCE!



Cord construction completely reexamined. Over two years ago, U. S. Rubber engineers began a thorough reexamination of electrical cord design and construction. More than a thousand cords, including those of all major competitors as well as our own U. S. Royal Cord, were thoroughly and painstakingly analyzed. Over 10,000 tests were made to determine the principal causes of cord failure.

Every possible life factor was carefully and honestly appraised to find its relation to overall cord service.

With the findings at hand, "U. S." Engineers then drew upon their 64 years of experience in the manufacture of fine quality wire and cable to produce this exceptional new cord.

Every fault uncovered by the exhaustive two-year testing was tackled and solved.

Tested and proved. The new U. S. Royal Master was then tested against all competitive cords—installed in outside plants for final on-the-job corroboration.

U. S. Royal Master Cord proved itself to be unquestionably the finest cord you can buy! So superior, it gives almost double the service life of the average of competitive molded cords—actually gives you $1.88 in value for every cord dollar!

Prove for yourself the phenomenal superiority of U. S. Royal Master. Write to address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today!

RUBBER COMPANY
ROCKEFELLER CENTER, NEW YORK 20, N. Y.

POWERS *American*

presents the

"Sky-

the Ultimate

IN TWO SIZES . . .
for all types of overhead work

SERIES AB-37 has a maximum ground-to-basket floor height of 37′, enabling two men to work 42′ above ground.

SERIES AB-43 carries two men to a comfortable working height of 48′. Maximum ground-to-basket floor height is 43′.

SKY-MASTER can be installed on a Powers-American Body which fits individual operating needs. It can be furnished with an engine-driven air compressor having air lines extended to outlets at work baskets.

POWERS-

McCABE-POWERS

5900 NO. BROADWAY • ST. LOUIS 15, MO.

"Master"

in Aerial Equipment

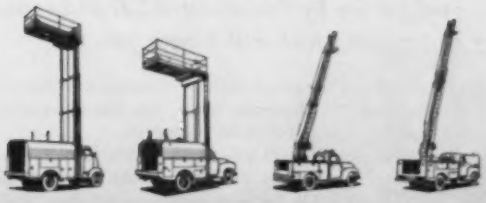
SKY-MASTER consists of a pair of hydraulically-actuated beams and a revolving mast—developed by Powers-American engineers into an aerial unit which is unsurpassed in versatility . . . safety . . . and operating simplicity.

Its inner beam can be positioned anywhere in an 85° arc. Its outer beam—to which twin, reinforced plastic work baskets are attached—moves hydraulically, in combination with drive pulleys and ¼" wire rope—to any point in a 265° arc. The revolving mast will rotate continuously . . . in either direction. An independent control lever for the mast and each beam is installed beside the work baskets.

For operator protection—insulation against 50,000 volts is provided on the outer beam . . . SKY-MASTER automatically locks in any position to which it is moved . . . hydraulic outriggers, on each side of the body, furnish absolute stability . . . constant flow of oil is maintained in cylinders at all times . . . and relief valves prevent overloading.

A complete description of SKY-MASTER'S construction, operation, and safety features is given in Powers-American Bulletin No. 410. A copy, with price information, will be sent—without obligation—upon request.

POWERS-AMERICAN . . .
Your ONE SOURCE for AERIAL EQUIPMENT



UP

OUT

OVER

DOWN

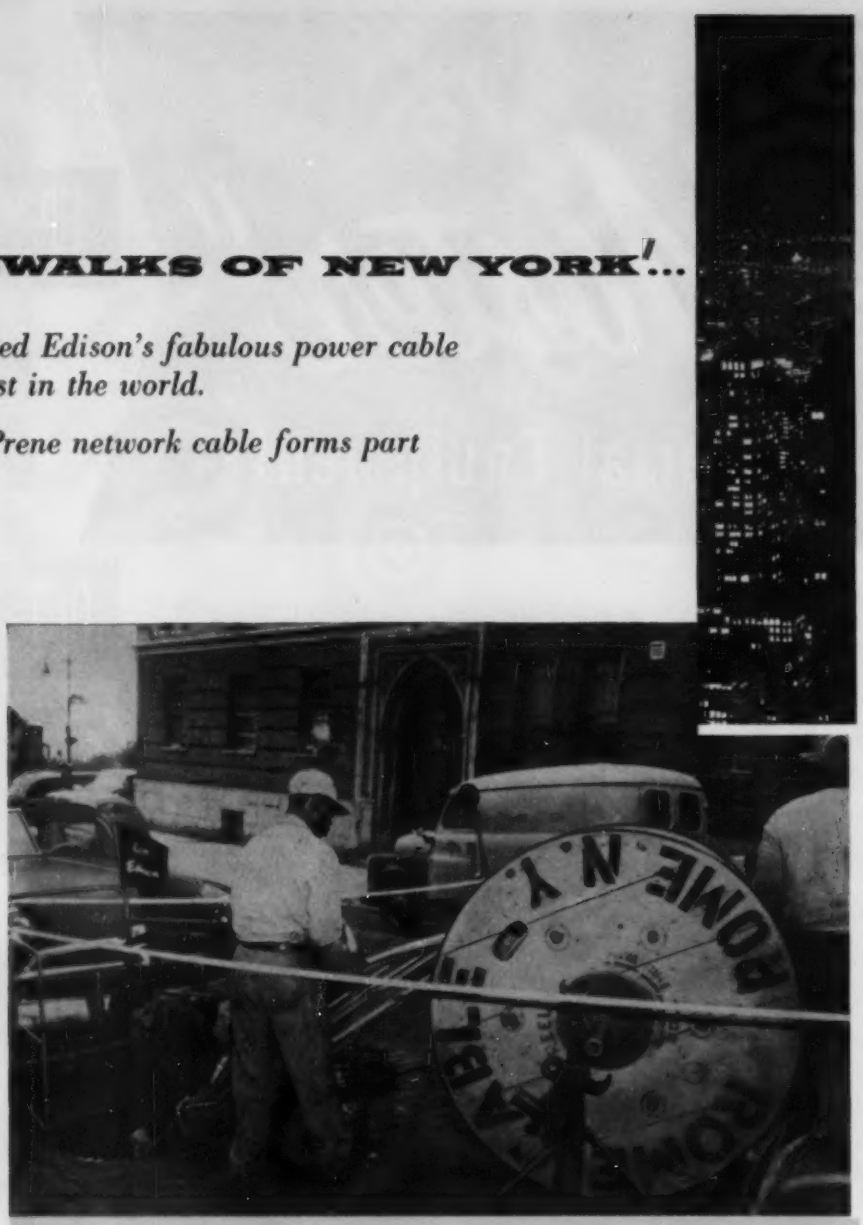
AMERICAN DIVISION
AUTO BODY COMPANY
625 CEDAR STREET • BERKELEY 10, CALIF.

Under

'THE SIDEWALKS OF NEW YORK'...

...lies Consolidated Edison's fabulous power cable network, largest in the world.

RoMarine-RoPrene network cable forms part of this system.



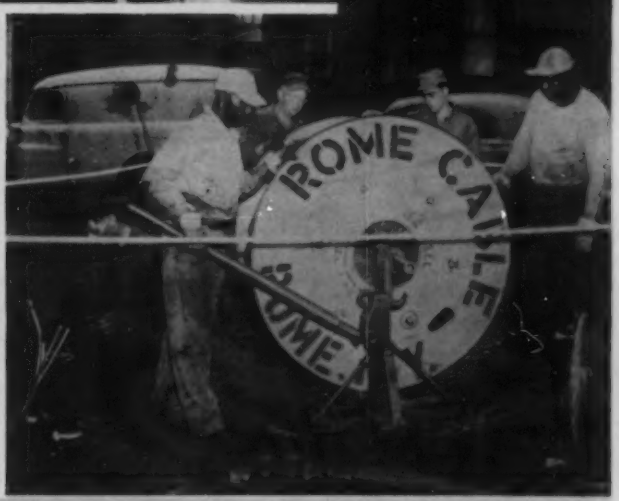
At 160th Street and Riverside Drive a "Con Edison" crew . . .

RoMarine-RoPrene, accepted for use by Consolidated Edison in their vital network, has many advantages which will benefit you, too.

RoMarine insulation is a high-quality heat- and moisture-resistant insulation with outstanding electrical stability after long-time submersion in water. It also offers excellent aging and overload characteristics, ease of handling and installation. Splicing is simple.

RoPrene sheath is tough, all-resistant Neoprene with its exceptional resistance to abrasions, acids, oils, flame, weathering and moist chemicals.

It will pay you to investigate the advantages of Rome RoMarine-RoPrene cable for your underground duct or direct-burial-in-earth installations. Send today for more complete information.



. . . installs Rome network cable (RoMarine-RoPrene) . . . in New York's underground system.

It Costs Less to Buy the Best

ROME CABLE
Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

Here's why the Ljungstrom saves fuel...improves boiler performance

1

1. Saves Fuel — Savings are roughly 1% for every 45-50°F of preheat, since this heat has been recovered in usable form from flue gases.

2

2. Increases Boiler Output — Preheating combustion air increases boiler furnace temperature. Heat absorption into boiler tubes increases at the same time, raising the unit's capacity to produce steam.

3

3. Increases Boiler Reliability — Preheating leads to more complete combustion of fuel; therefore, less slagging. By burning fuel more completely, it helps boilers stay on the line longer. Furthermore, gases to dust recovery units are cleaner.

4

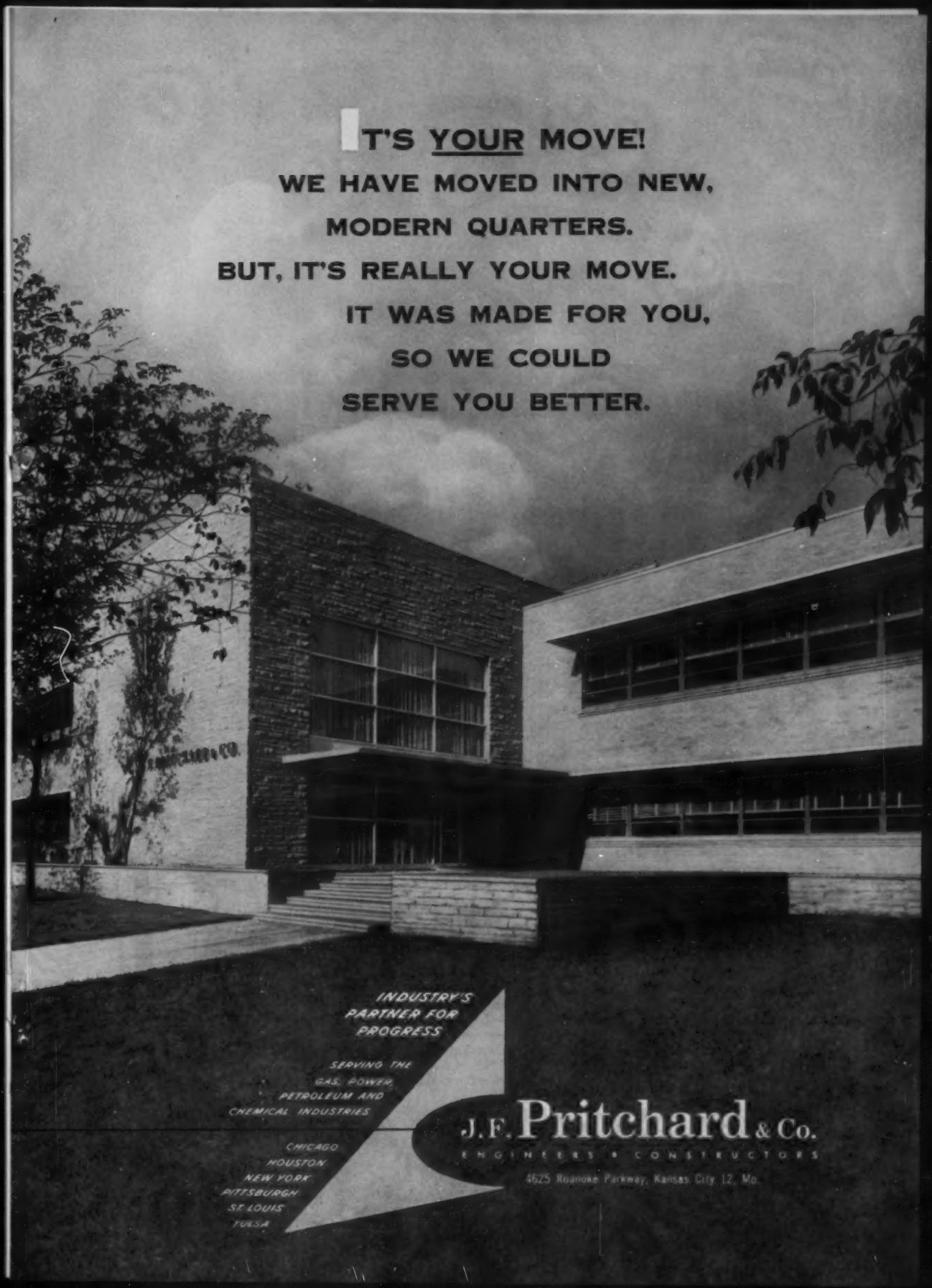
4. Permits Use of Lower Grade Fuels — Saw and paper mill refuse, wood, lignites, peat, bagasse and similar low-grade fuels become commercially practical when preheated combustion air is used.

The Ljungstrom® Air Preheater . . . used in seven out of ten large boiler installations—is the most compact, reliable and versatile preheater available. Installed in a boiler, it leads to the four well-known advantages listed at the left.

Remember: the ability to deliver these important benefits in full measure is an important reason why more than twice as many Ljungstrom Air Preheaters are specified for large boilers than all other types combined.

WHEREVER YOU BURN FUEL, YOU NEED LJUNGSTROM

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.


IT'S YOUR MOVE!
WE HAVE MOVED INTO NEW,
MODERN QUARTERS.
BUT, IT'S REALLY YOUR MOVE.
IT WAS MADE FOR YOU,
SO WE COULD
SERVE YOU BETTER.
INDUSTRY'S PARTNER FOR PROGRESS
SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES
CHICAGO
HOUSTON
NEW YORK
PITTSBURGH
ST. LOUIS
TULSA
J. F. Pritchard & Co.
ENGINEERS • CONSTRUCTORS
4625 Roanoke Parkway, Kansas City 12, Mo.

Pulse Position Time Division

MICROWAVE

First Successful Method of Multiple Channel Communication in 25 Years

YES, of all methods tried, only Pulse Position Time Division systems yield all the objectives desired in multiplex equipment. Inherently, it sets new standards for reliability . . . economy . . . and loading. Widespread military usage has proved this. And, wherever it has been applied to industrial installations, equal success . . . equal preference has resulted. Recognize the advantages of being able to: Use elementary RF equipment . . . obtain direct crystal control of RF . . . appiy modern and high speed visual servicing . . . have up to twenty-four fully-loaded channels free from cross talk . . . work with totally independent channel adjustment . . . and gain multiple repeats plus exceptional performance!

Today, there are 50,000 channel miles of this perfected G-E microwave in use. Take note of this wide experience. Let G. E. recommend the equipment to serve you best. *Sec. X1915-24, General Electric Company, Electronics Park, Syracuse, N. Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

SOUTH CAROLINA — Typical installation of Type PBO Disconnect Switches in South Carolina. They are adaptable for wood-pole mounting on rural lines and distribution feeders.

WHY LEADING UTILITIES SPECIFY SOUTHERN STATES TYPE PBO DISCONNECTS

Thousands of Southern States Type PBO Disconnect Switches are in use from coast to coast, Canada to Mexico. Here is why they are specified by leading utilities:

HIGH PRESSURE double line contacts. Positive contact assured by wiping action of accurately machined surfaces. Hard drawn copper bus bar blades; double blade construction. 90° open position blade stop unless otherwise specified.

EXTRA LARGE OPERATING RING of heavy duty construction.

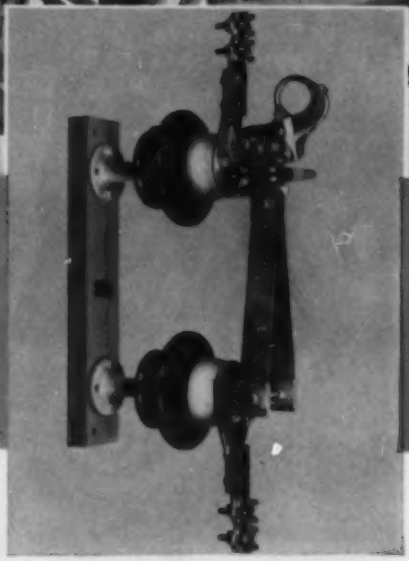
POSITIVE LATCHING of blade in the closed position prevents opening under fault currents or from vibration.

BLADE PRY-OUT applies a powerful mechanical force to open the blade even under heavy coatings of ice.

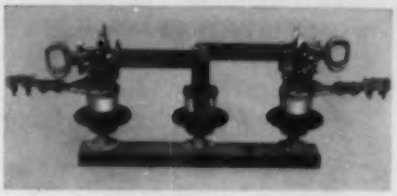
CAST BLADE GUIDES are rigid and wide-flaring to position the contacts properly on each closing operation.

STEEL BASES, hot-dipped galvanized after fabrication, are available to specification.

All of those features, coupled with Southern States reputation for high quality equipment, are why more and more utilities are insisting on the Type PBO Disconnecting Switch. It will pay you to do likewise.



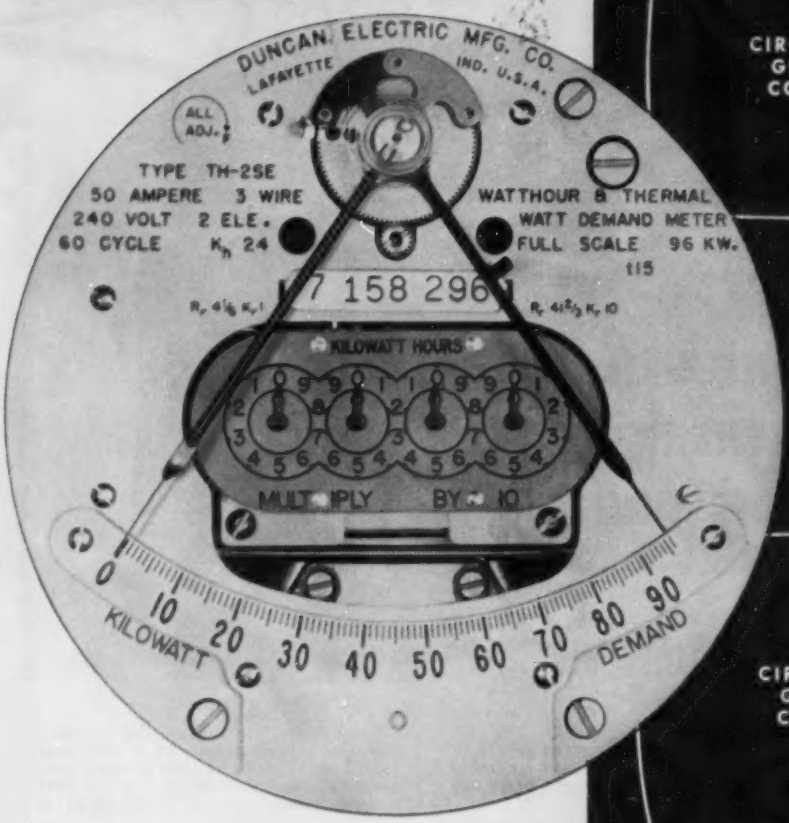
Southern States Type PBO switches are available in all capacities from 400 to 3000 amps and 7.5 to 115 kv for all types of single pole, disconnect switch installations. The type PBO conforms in every respect to NEMA standards.

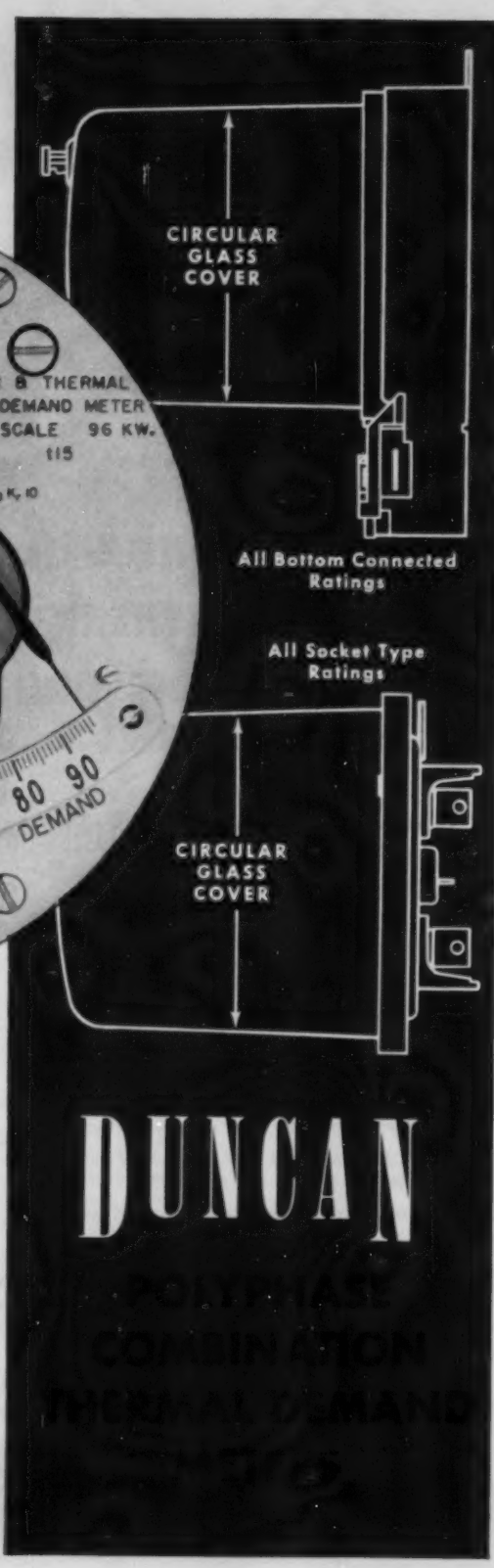


DPBO-2—Southern States double-blade selector switch suitable for applications where it is necessary to supply a load from either one or both of two available sources. Switch construction permits transfer of load from one source to another without circuit interruption.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

COMPACT DESIGN!





1. Complete Polyphase Combination Thermal in standard circular glass covers—saves space.

2. Available in all types and ratings—3- or 4-wire.

3. Built in "extended range" ratings—self-contained capacity to 200 Amps.

4. All calibrating adjustments accessible from front.

DUNCAN ELECTRIC MFG. CO.

LAFAYETTE INDIANA

Pioneers in Extended Range Metering

TOP OF THE LINE

DEPENDABLE, LIGHTWEIGHT, LIFETIME

ANDERSON

Aluminum CONNECTORS

A TROUBLE-FREE COMBINATION . . LC-81A AND DE-101 . . . WITH ALL THE "BUGS" ENGINEERED OUT! DESIGNED FOR EASY HANDLING AND QUICK, POSITIVE INSTALLATION!

ANDERSON connectors, clamps, fittings and accessories are designed and engineered for strength, durability and high efficiency. ABW products are recognized standards in the industry.

ANDERSON makes "top of the line" handling of power connectors, clamps, fittings and accessories *fumble-proof*, too! Usually just one wrench is the only tool a lineman will need.

☆ABW DESIGN MEANS QUALITY *plus* STRENGTH in the RIGHT PLACES

Consult one of our nearest 20 representatives or contact our main office.

Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES for SUBSTATION • TRANSMISSION • DISTRIBUTION SYSTEMS *for over a Quarter Century*

ANDERSON BRASS WORKS, INC.

P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

Come to the plant and going into I-T-E Metal-

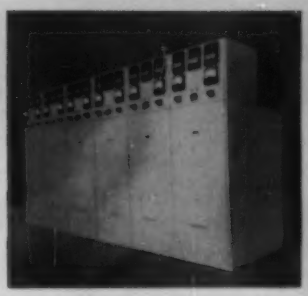
1. Horizontal drawout design. Even heavy 13.8 kv circuit breakers, such as this one, roll out easily on permanently attached wheels. Breaker compartment is full-depth, one-piece welded frame, retains shape, permits lifting as a unit.

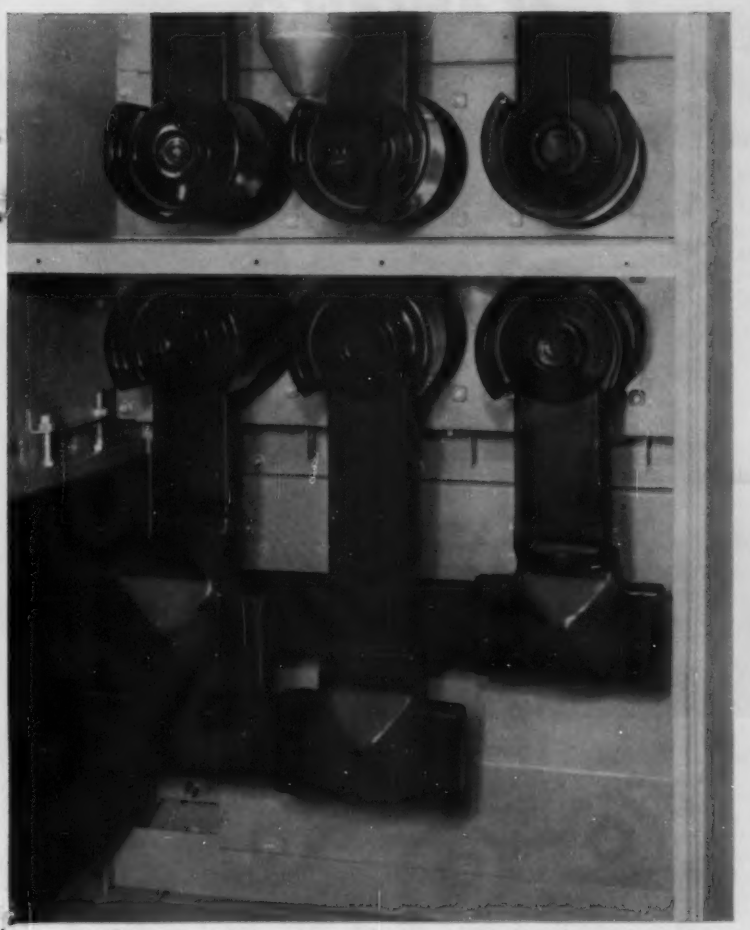
2. Positive arc interruption. On 13.8 kv breakers, double-coil, closed-iron magnetic blowout circuit draws arc rapidly into overhead quenching chute. Pivoting arc chutes, shown above, facilitate maintenance. Note sturdy contact assembly.

Discover in these pictures just a few of the extra-value, quality features in all I-T-E Metal-Clad Switchgear. They were taken right here in the I-T-E plant and show the equipment in process of manufacture.

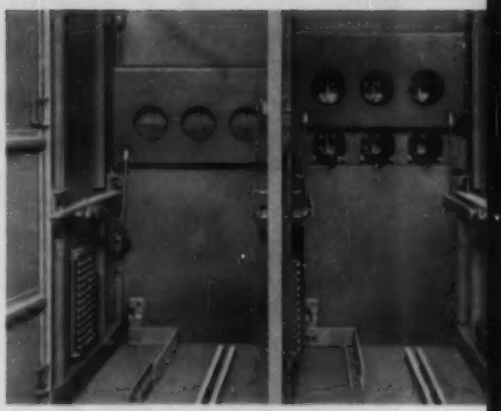
If you're planning new construction where you will need metal-clad switchgear, take a tip that can help you make the very most of your investment dollar: Visit the I-T-E plant here in Philadelphia. See the quality features actually being built into the equipment—quality that keeps I-T-E Switchgear performing more safely and dependably all the years it serves you. See the scenes shown on these pages, plus dozens more like them. See the extra value in I-T-E Switchgear that you won't find in any other

see the extra value Clad Switchgear





3. Bus rigidly braced, heavily insulated. View into rear of 13.8 kv compartment shows porcelain disconnect bushings and bus supports which insulate and hold the bus in alignment during short circuit stresses. Steel paneling throughout forms isolated compartments.



4. Superior isolation of compartments. Gravity-type shutters, shown closed at left and blocked open at right, isolate primary terminals from breaker compartment.

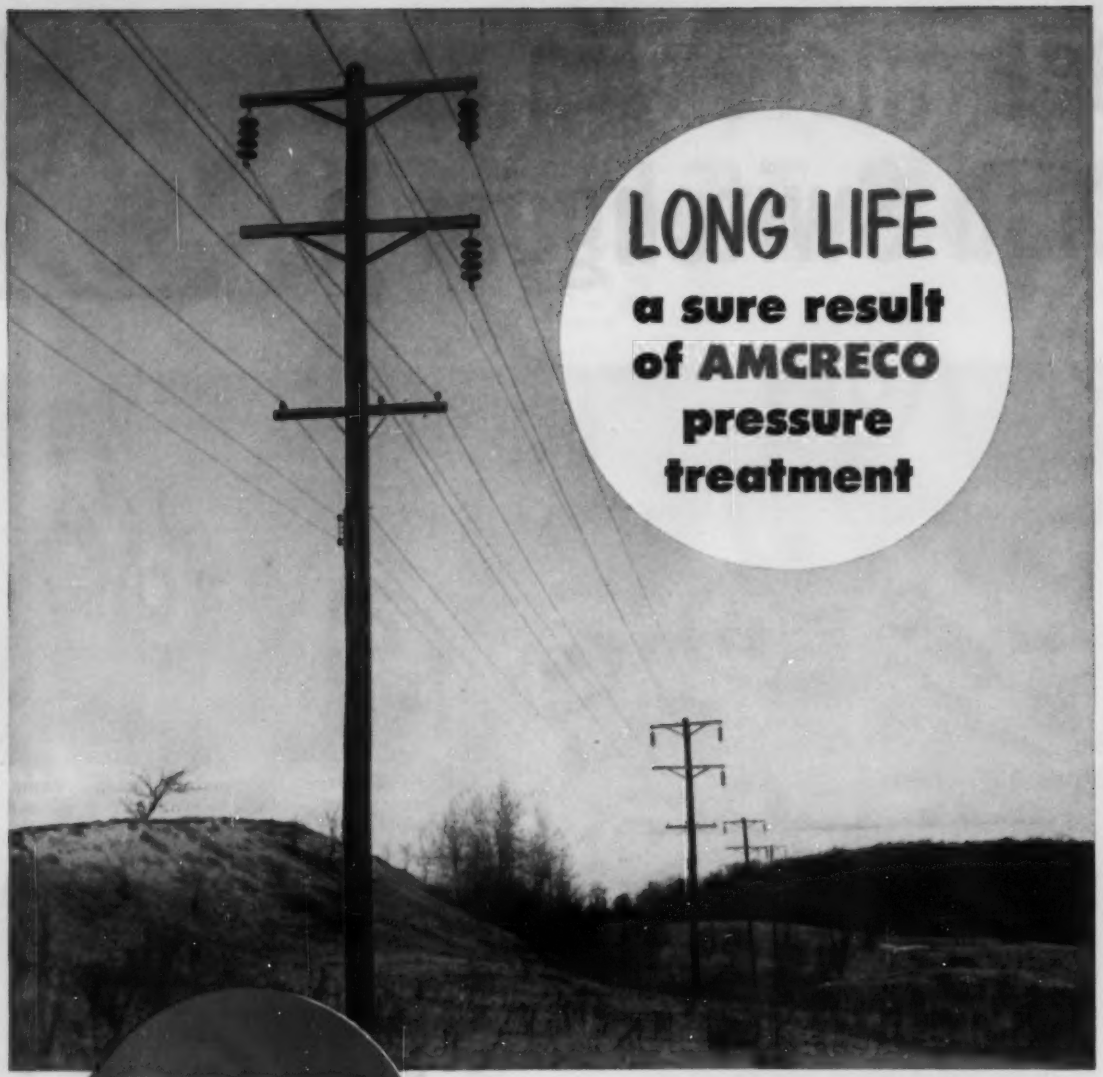
5. Fine, durable finish. All panels and doors are first bonderized and cleaned with spirits, then painted with three coats of enamel—baked on and rubbed down.

make. I-T-E Metal-Clad Switchgear is available in ratings through 13.8 kv, 500 mva.

For details, contact the I-T-E field office nearest you. Look in your classified directory under "Electric Equipment." I-T-E Circuit Breaker Company, Switchgear Division, 19th and Hamilton Sts., Philadelphia 30, Pa.

I-T-E

CIRCUIT BREAKER COMPANY
Switchgear Division



Amcreco
Lowry Process
Creosoted Products

POLES
PLANK
CROSSARMS
CONDUIT

You can reduce maintenance costs and build extra years of service into your lines by installing Amcreco pressure treated poles. Amcreco pressure treatment with creosote oil preserves the natural strength of the wood—armors the pole against insects and fungi—assures greater strength and dependability throughout the life of the pole.

Our nearly fifty years of experience in creosote treatment and our strategically located facilities are at your service. Let us discuss your next requirements with you.

AMERICAN CREOSOTING COMPANY

COLONIAL CREOSOTING COMPANY — GEORGIA CREOSOTING COMPANY

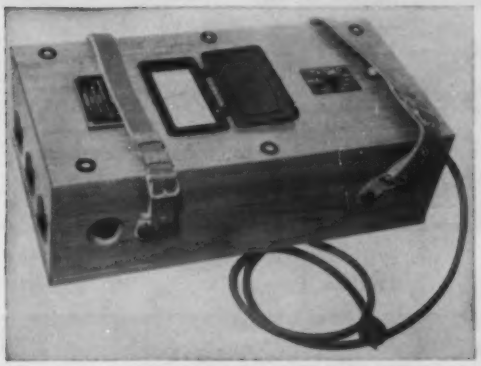
GENERAL SALES OFFICE—CHICAGO, ILLINOIS
10 FIELD SALES OFFICES TO SERVE YOU

BIDDLE *Instrument News*

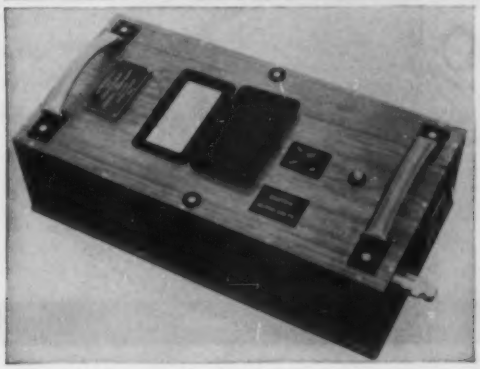
NEW PRODUCTS

RECTIFIER OPERATED, HIGH-RANGE MEGGER® INSULATION TESTERS

Triple and Single Voltage Models



Triple-Voltage
5000, 2500 and
1000 Volts d-c
Up to
100,000 Megohms



Single-Voltage
10,000 Volts d-c
Up to
200,000 Megohms

The high ranges now available in "Megger" Insulation Testers are extremely useful in several kinds of field tests. In the case of bushings, the insulation resistance of new units should be in the order of 50,000 megohms, and any deterioration that may occur in service, which can be detected at 2500 volts d-c, will be quickly observed with a "Megger" Instrument, of that range and voltage. The high-range "Megger" Instrument in ranges up to 200,000 megohms and ratings up to 10 kv, therefore, gives the maintenance engineer a simple and relatively inexpensive tool for detecting the deterioration in bushings in its early stages.

Generators, transformers and cables can have relatively high 1-minute insulation resistance values which may increase with time during a time-resistance test. In such cases—and they are frequent—the instrument range should be high enough to permit observation of this increase of resistance with time.

These are only a few of the many applications for these instruments. For complete information on all hand-, motor-, or rectifier-operated, high-range Megger Testers request **Bulletin 21-20-EW.**

Biddle Dielectric Test Set Model 1-40 KV

—for measuring d-c current at voltages up to 40 kv when applied to the insulation of such equipment as generators, transformers, bushings and cable.

Carefully considered safety features, excellent output voltage regulation, simple operation, compact design, and facilities for making voltage and current measurements at either polarity have been incorporated in this test set.

The set has a current rating of 25 milliamperes at short circuit, and current measurements can be made down to 0.5 microamperes which is the first division on the microammeter.

Overall dimensions are: height 19½ in., width 13½ in., depth 20 in., weight 120 lbs. All high voltage components are oil immersed.

For complete details, description, specifications, and prices, write for **Bulletin 22-EW.**

James G. Biddle Co.
1316 Arch St., Phila. 7, Pa.
Gentlemen: Please send me
☐ **Bulletin 21-20-EW**
☐ **Bulletin 22-EW**

NAME
JOB FUNCTION
COMPANY
ADDRESS

JAMES G. BIDDLE CO.
1316 ARCH STREET • PHILADELPHIA 7, PA.
ELECTRICAL TESTING INSTRUMENTS • SPEED MEASURING INSTRUMENTS • LABORATORY & SCIENTIFIC EQUIPMENT

Now—
good service insurance for electric utilities—

ELECTRO-MOBILE POWER

HERE'S A NEW, low-cost safeguard of the dependable, adequate power supply for which electric utility companies are noted.

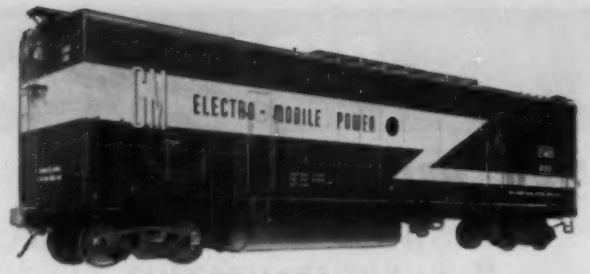
These two types of mobile generating units can be moved by rail or highway to the point of need—and then, following a simple connection, supplementary power of any desired amount can be on the line within 45 seconds!

For fringe area boosting, for peak skimming, for emergency use or temporary demand, these products of General Motors' Electro-Motive Division provide a flexible, economical tool.

These units, completely self-contained, can be fully automatic in operation. They offer the most advanced electrical engineering, equipment and controls, plus the well-proved dependability of a famous Diesel engine.

Mass-produced on the long-established lines of Electro-Motive Division's specialized plants, their cost is unprecedently low. Servicing facilities are nationwide. And the equipment investment is protected by a modernization program that prevents obsolescence.

We invite the inquiries of any electric utility company interested in service expansion.

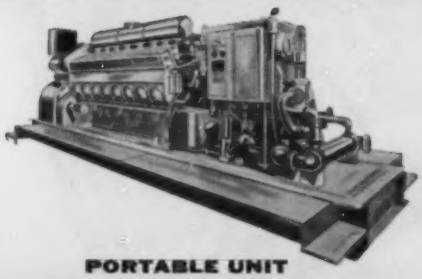


RAIL UNIT

1,000 and 750 kw. units for use on sidings, or placed on piers for semi-permanent use.

TRUCK UNIT

500 and 350 kw. capacities to move on highways to desired sites.



PORTABLE UNIT

1,000, 750, 500 and 350 kw. capacities, for permanent or semi-permanent installations.

ELECTRO-MOBILE POWER FEATURES INCLUDE:

- Remote control starting and stopping
- From starting to full load within 45 seconds
- Automatic synchronization with line in phase, frequency and voltage
- Full protective equipment, including 3-phase surge capacitors, lightning arresters, over-current relays, field failure relay
- Complete self-operation can be provided
- Ability to meet higher capacity needs by unit multiplication
- Complete national parts and service availability

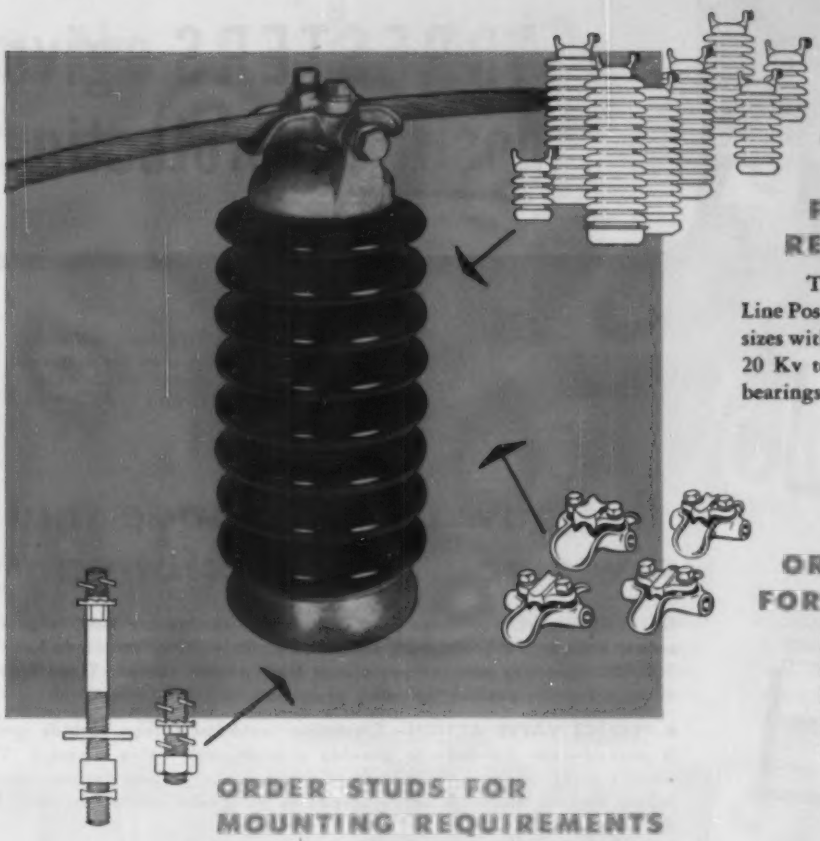
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
La Grange, Illinois

Sold and serviced directly through a manufacturer's organization. Electro-Motive Division offices in: New York City, Chicago, Jacksonville, St. Louis and San Francisco.

LOW INVENTORY

and ECONOMICAL WAREHOUSING

with LAPP CLAMP-TOP LINE POSTS



ORDER INSULATORS FOR VOLTAGE REQUIREMENTS

The series of Lapp Clamp-Top Line Posts consists of insulators in eight sizes with ratings for line voltages from 20 Kv to 88 Kv. Caps with trunnion bearings are identical in all sizes.

ORDER CLAMPS FOR CABLE SIZES

Four sizes of clamps (choice of ferrous or aluminum) provide for conductors of sizes .25" to 1.50" diameter. Every clamp fits every insulator size.

ORDER STUDS FOR MOUNTING REQUIREMENTS

Studs on Lapp Line Posts are separable. 7" studs for wood cross-arms, 1¾" studs for metal mounting—or longer studs to go through poles for horizontal mounting of insulators—are interchangeable, and may be installed in the field. Serrated surfaces in insulator base and stud flange engage a "positive" lock washer—provide a permanent vibration-proof attachment.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

Here's why CRYSTAL VALVE ARRESTERS give positive protection

UPPER SPARK GAP ASSEMBLY
CRYSTALLITE GIVES MULTI-PATH DISTRIBUTION OF SURGE
LOWER SPARK GAP ASSEMBLY
VENT OPENINGS ELIMINATE CORROSION DUE TO MOISTURE

INSPECTING CRYSTALLITE. Every batch of oxidized silicon carbide grain (used as valve element of CRYSTAL VALVE Arresters) is checked for grit size, coating and electrical performance.

It's how they're made that gives you peak performance

CRYSTAL VALVE Ventilated Gap Lightning Arresters are built to protect power lines and transformers indefinitely. Only three known failures in 500,000 lightning arrester years mar their perfect record. Three factors account for this *positive* lightning protection:

- **PERFECT VALVE ACTION—Crystallite (oxidized silicon carbide grain) is *packed*—not bonded—to provide a multi-path valve element. This insures quick, uniform distribution of surge discharge, fast suppression of follow current. No other valve surpasses the performance and long life of CV Arresters.**
- **ULTRA-SPEED GAP—Multiple-gap arcing unit is service-engineered to be the fastest gap in the industry. Large, smooth arcing surfaces, extremely accurate dimensions of gap and components give super speed and super safety.**
- **SURE GAP VENTILATION—Vent openings expel conductive ionized gases, bring in fresh air for high resistance to circuit current. Assures dry, clean interior . . . freedom from gap corrosion.**

For long life under every known condition, you need the positive protection of CRYSTAL VALVE Ventilated Gap Lightning Arresters.

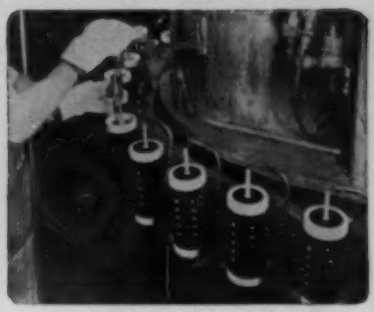
WRITE TODAY, LISTING YOUR SERVICE REQUIREMENTS, AND ASK FOR COMPLETE ENGINEERING AND INSTALLATION DATA

CRYSTAL VALVE
LIGHTNING ARRESTERS

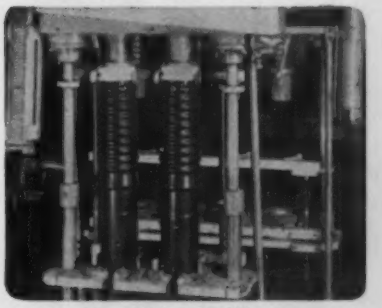
Ventilated Gap you the you need

Steps in Making CRYSTAL VALVE ARRESTERS

1. High-strength Porcelain Body is formed on lathe before firing in kiln. Wet-process porcelain for electrical use provides dense, sturdy housing of high dielectric and thermal strengths.



2. Moisture-proofing Arrester bodies as they revolve, up-ended, on "merry-go-round." Molten compound is poured onto gasketed ground contact plate, around main ground stud member.

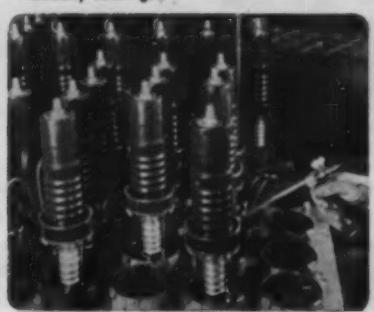


3. Precision Filling Machine automatically measures Crystallite grains into Arrester body. Line contact plate and gasket retainer plate are placed on top of valve element.

4. Uniformly Settling Grains of valve element assures uniform surge current distribution. Rocking, rotating and pneumatic packing of grains are followed by hermetically sealing.

5. Ultra-speed Arcing Units are assembled: electrodes, steatite ceramic rod and spacers, terminal "hardware." Spark-gap assembly is inspected, installed in Arrester over retainer.

6. Sure-fit Copper Cap Crimped over Arrester body by hydraulic pressure. (Arresters receive glass housing at this point.) Base "hardware" is assembled, fastened.



7. Weather-proof Sealing Cap. Non-siphoning line lead is attached, porcelain top cap installed. Sealing compound is poured into cap and housing skirt, "torched off."

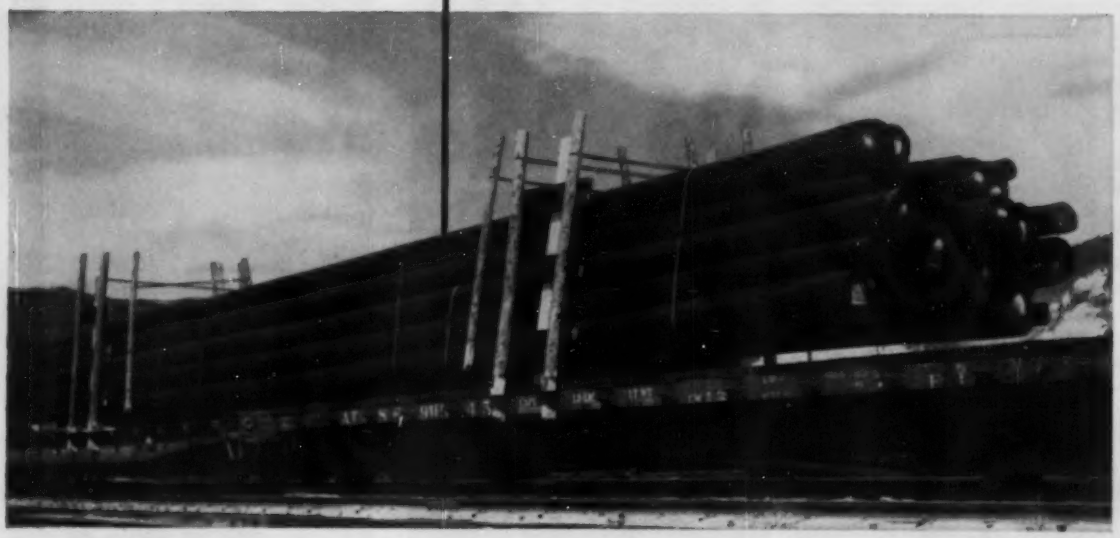
8. 100% Pre-Tests at 60 Cycles impose higher-than-rating voltages. Dynamic Test simulates lightning stroke; Arc-over Test tells at what voltage Arrester "opens" to lightning surge.

Electric Service Manufacturing Co.

PHILADELPHIA 32, PENNSYLVANIA

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

1 *product*	**Treated "Double Life" Larch Poles**
2 *made by*	**J. Neils Lumber Co.**
3 *purpose*	**Transmission Use**
4 *customer*	**One of America's Largest Utilities**
5 *reasons purchased*	**Long Life...Low Maintenance**



Big transmission poles require big facilities and equipment; big know-how in pole manufacture and big natural resources. All of these requirements are available at J. Neils. Pole manufacture (from our own timber) is concentrated on Western Larch, Lodgepole Pine and Douglas Fir. And our pole output carries the added value of "Double Life" treatment (penta or creosote).

Write for illustrated folder and information on the application of J. Neils "Double-Life" treated poles to your specific requirements.

J. Neils Lumber Company

POLE DIVISION: *LIBBY, MONTANA*

HIGH-POTENTIAL TESTS HELP PROVE . . .

NEW INSULATION MAKES G-E MOTORS LAST 50% LONGER

See Details Inside

50% LONGER MOTOR LIFE

IN ACCELERATED LIFE TEST, General Electric's new Polyex insulation proved that it could take extreme heat aging and mechanical stress. Here is a summary of test results...

An engineering achievem

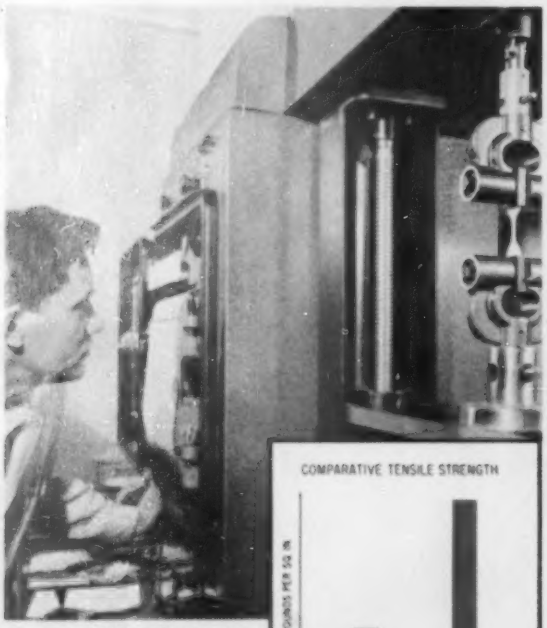
General E
That is 7

REVOLUTIONARY *POLYEX* INS
OF THE AMAZING PROPERTIES O

General Electric has developed a completely new Class A insulation for form-wound coil which lasts 50% longer than other insulations in use today. Its greater ability to withstand physical and thermal stresses provides an added margin of protection that will mean tremendous savings to you because of reduced motor failure and maintenance costs.

POLYEX INSULATION is a balanced system o polyester films and fibres, together with new hydrocarbon resins. Materials in new Polyex insulation have high dielectric and physica

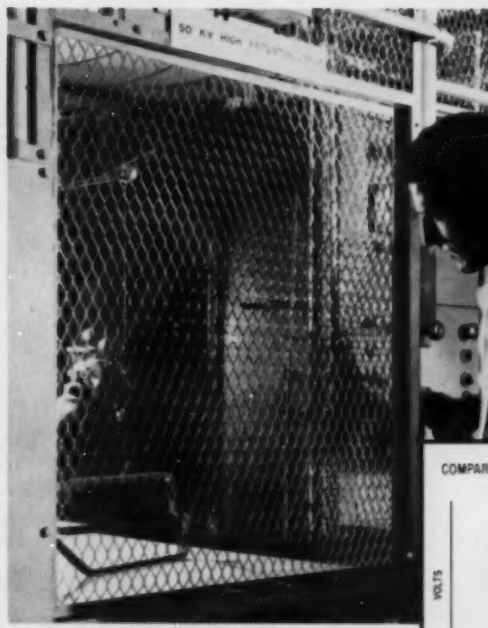
7 TIMES GREATER PHYSICAL STRENGTH



TENSILE STRENGTH of new insulation offers a greater protection against physical stress.

CUT-THROUGH STRENGTH, seven times greater than conventional insulation, is another reason for long life.

50% MORE DIELECTR



INITIAL DIELECTRIC STRENGTH TEST measures insulation's ability to withstand operating and starting voltages, and the protection offered against insulation failure.

ement of vital importance to users of motors with form-wound coils . . .

Electric Develops New Insulation for Motors 7 Times Tougher, Adds 50% to Motor Life

INSULATION TAKES FULL ADVANTAGE S OF NEW POLYESTER FILMS AND FIBRES

letely coils ons in phys- added ndous ailures

em of new Polyex ysical

strength. For the first time, the cotton and paper-based tapes and sheets in conventional insulations have been eliminated.

RESULTS OF EXHAUSTIVE TESTS on new Polyex insulation are summarized on these pages.

Insulation qualities like these offer you tremendous savings in motor maintenance and a greater degree of service continuity than ever before possible.

GENERAL ELECTRIC RESEARCH for better insulation is a continuing program. Polyex insulation is the latest result of that program. Three years of intensive development and testing of materials and manufacturing techniques culminated in the most significant advance in large motor insulation in 45 years.

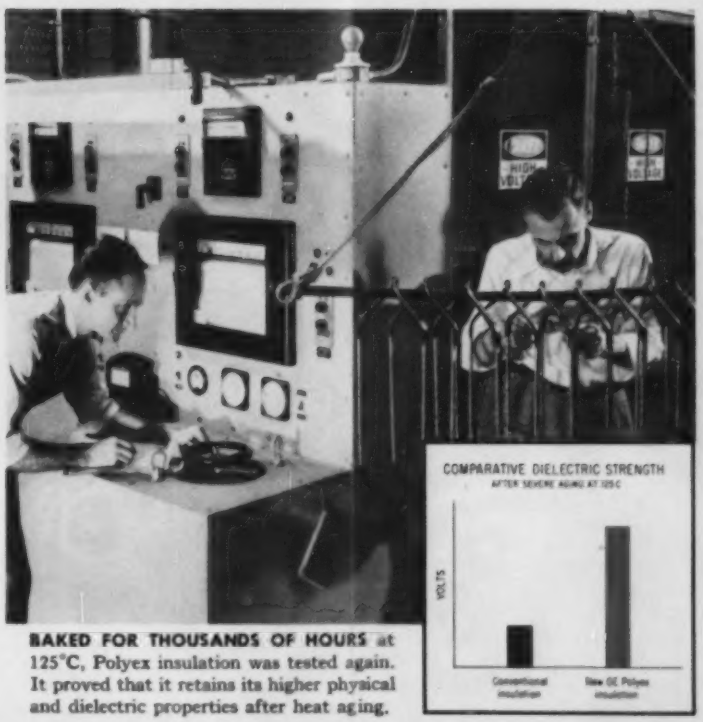
POLYEX INSULATION IS NOW AVAILABLE in many ratings of General Electric induction motors in the range of 100 to 3000 HP—and at no extra cost.

YOUR G-E SALES REPRESENTATIVE has complete information. Contact him at your nearby General Electric Apparatus Sales Office. *General Electric Company, Schenectady 5, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

TRIC STRENGTH, EVEN AFTER HEAT AGING



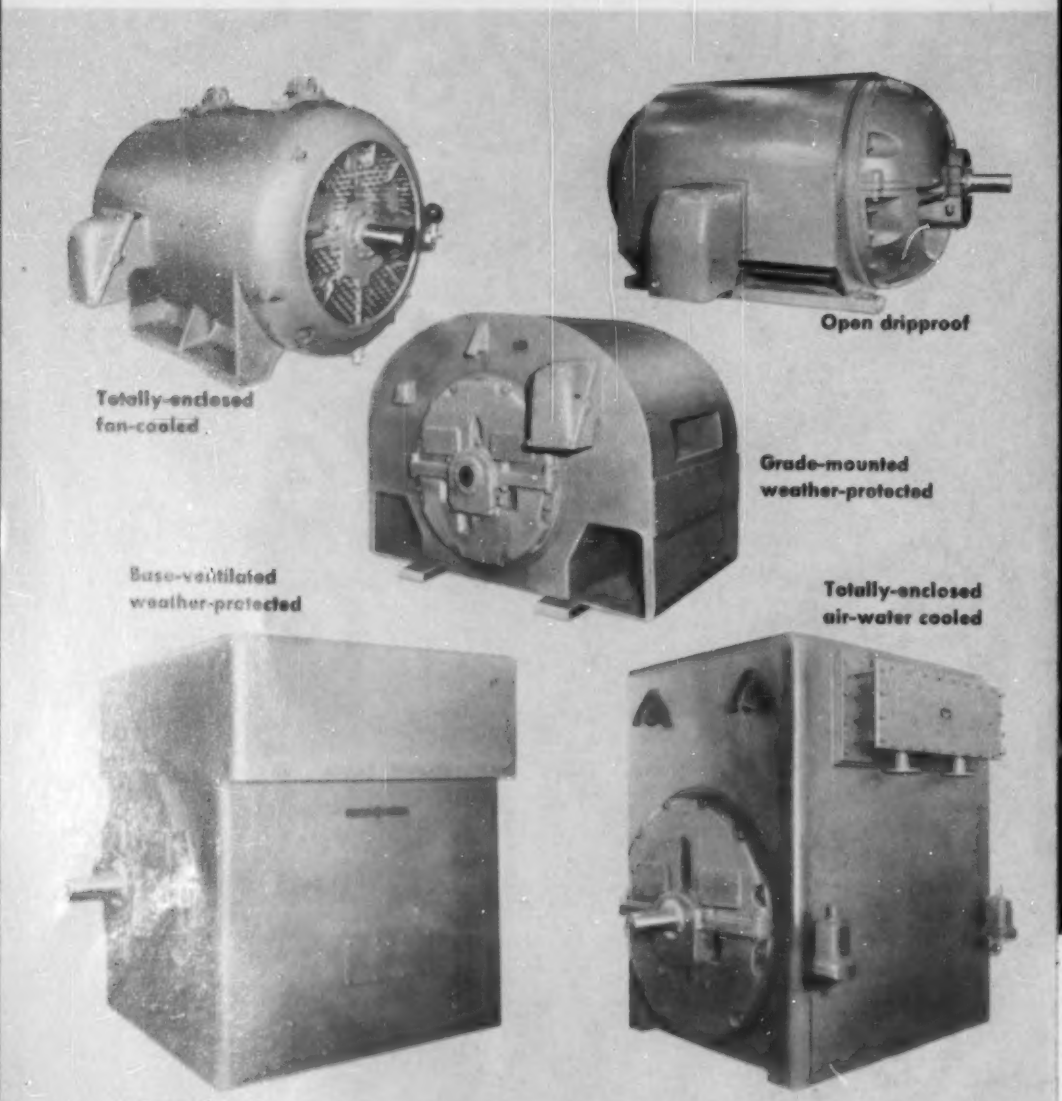
BAKED FOR THOUSANDS OF HOURS at 125°C, Polyex insulation was tested again. It proved that it retains its higher physical and dielectric properties after heat aging.

CONTAMINANT RESISTANCE DOUBLED

IN SALT SOLUTION, insulation's ability to resist contaminants was tested. Polyex-insulated coils were still operating long after conventional coils had failed.

NOW AVAILABLE IN MANY RATINGS OF THESE G-E INDUCTION MOTORS

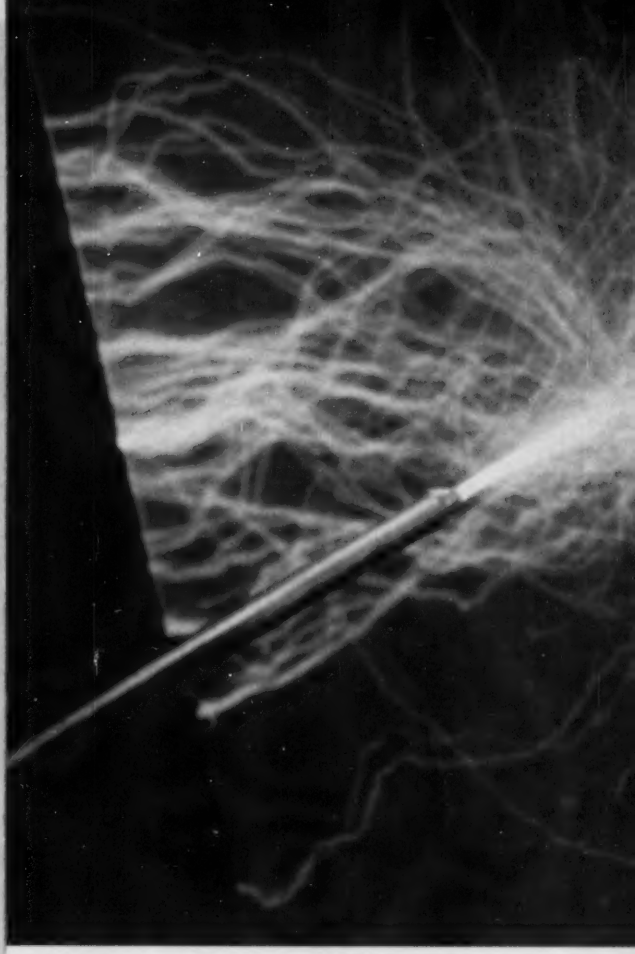
(Approximately 100 to 3000 hp)



Progress Is Our Most Important Product

GENERAL ELECTRIC

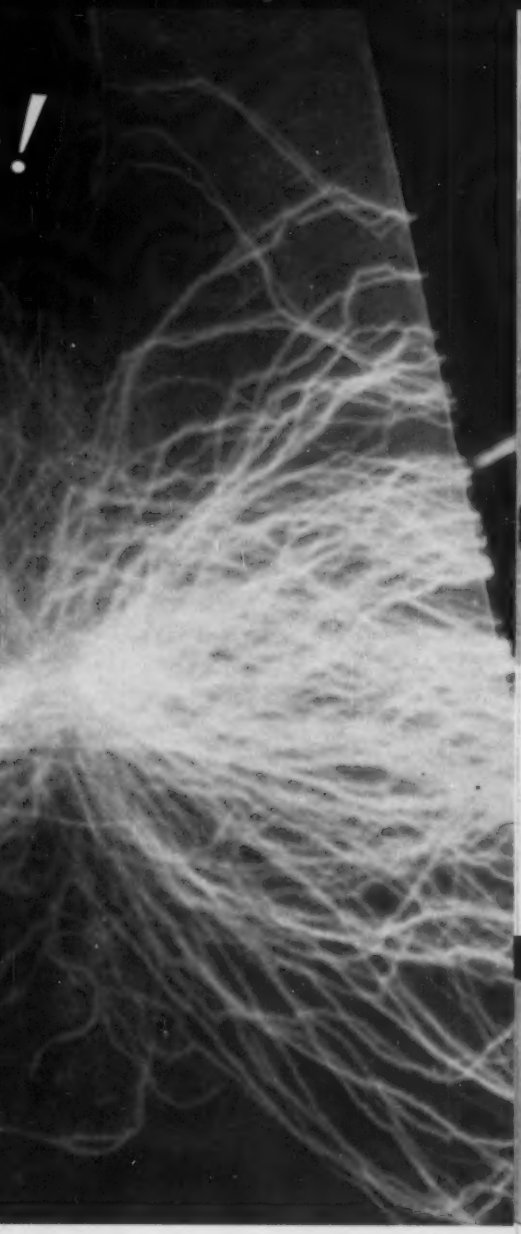
This is Progress!



HIGH-POTENTIAL TESTS HELP PR

NEW INSULATION MOTORS LAST 5

See Details Inside

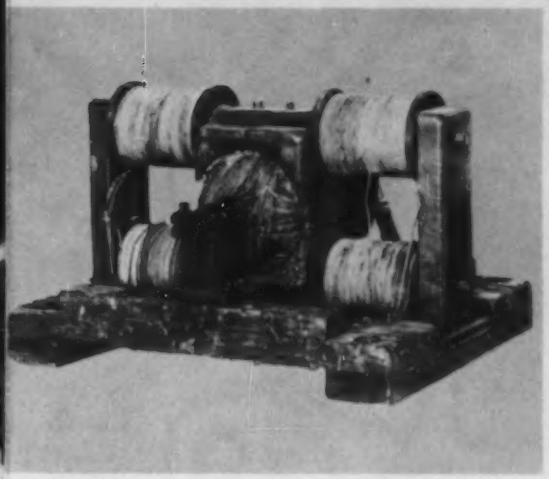


!

PROVE . . .

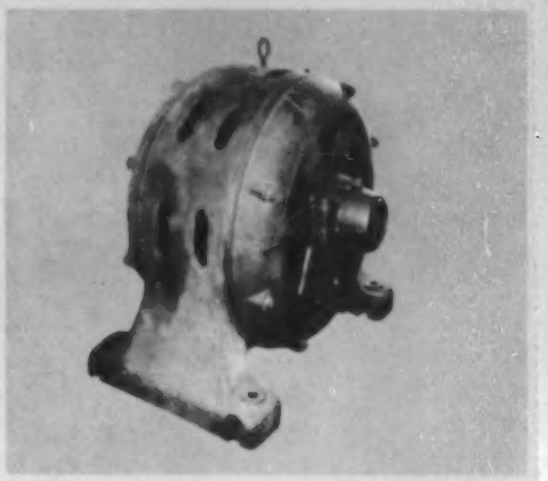
ON MAKES G-E
50% LONGER

THE THIRD MAJOR STEP IN THE EVOLUTION OF FORM-WOUND MOTOR INSULATION SYSTEMS



1878—FORM 1 INSULATION SYSTEM

Air was the insulator in early motor coils. Cotton was wrapped around the coils, but served only as a spacer to provide an air gap. The cotton wrapping itself was worthless as an insulator.

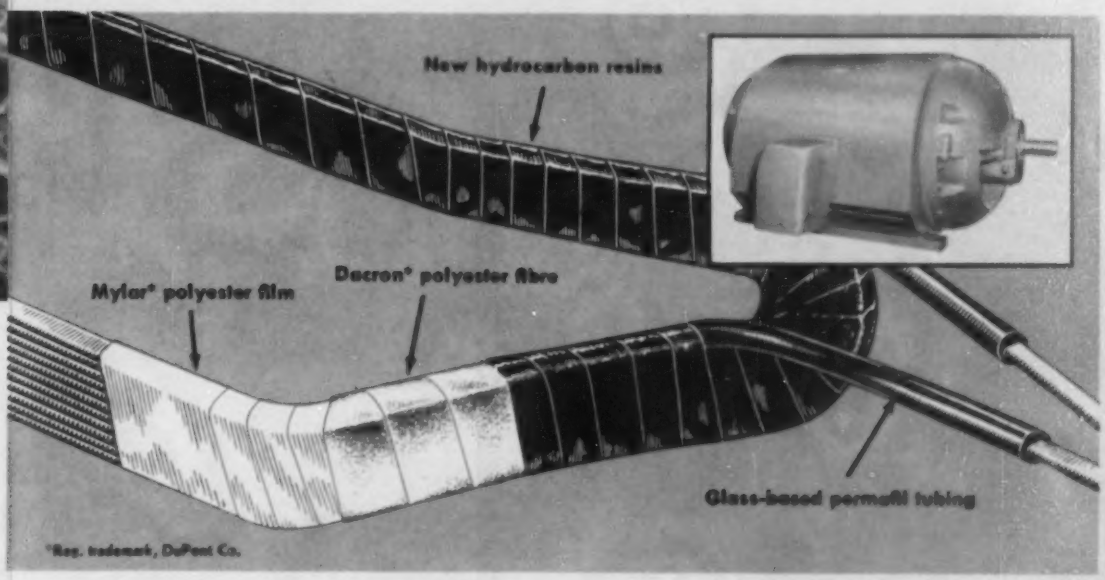


1910—FORM 2 INSULATION SYSTEMS ESTABLISHED

Linseed oil was added to cotton to provide insulating qualities. Since then, varnish and other insulating materials have replaced oil, but until now the basic concept has remained the same.

1954—G.E. INTRODUCES FIRST FORM 3 INSULATION SYSTEM

New G-E Polyex insulation becomes the first Form 3 insulation system. Made of polyester films and fibres, Polyex is the first insulation in which the materials have natural insulating qualities of their own.



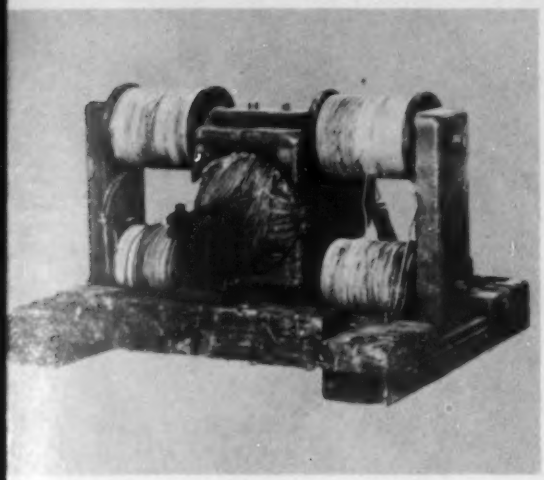
Progress Is Our Most Important Product

GENERAL ELECTRIC

830-14

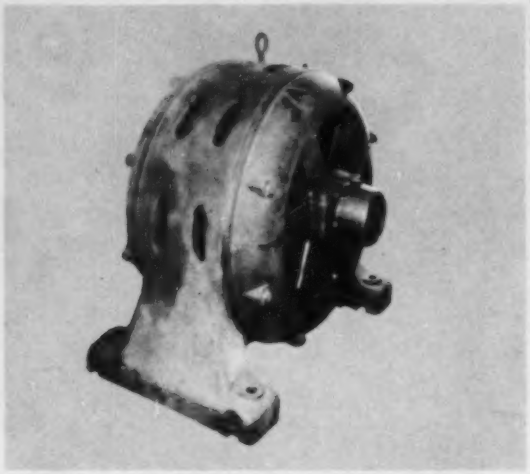
Want to keep this information? Tear along perforated edge.

THE THIRD MAJOR STEP IN THE EVOLUTION OF FORM-WOUND MOTOR INSULATION SYSTEMS



1878—FORM 1 INSULATION SYSTEM

Air was the insulator in early motor coils. Cotton was wrapped around the coils, but served only as a spacer to provide an air gap. The cotton wrapping itself was worthless as an insulator.

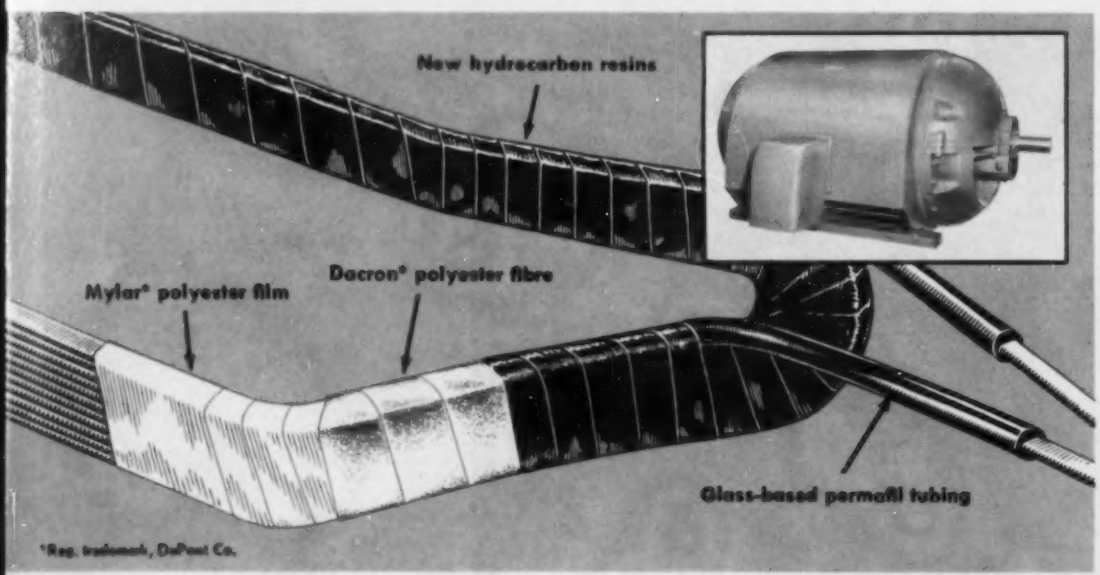


1910—FORM 2 INSULATION SYSTEMS ESTABLISHED

Linseed oil was added to cotton to provide insulating qualities. Since then, varnish and other insulating materials have replaced oil, but until now the basic concept has remained the same.

1954—G.E. INTRODUCES FIRST FORM 3 INSULATION SYSTEM

New G-E Polyex insulation becomes the first Form 3 insulation system. Made of polyester films and fibres, Polyex is the first insulation in which the materials have natural insulating qualities of their own.



Progress Is Our Most Important Product

GENERAL ELECTRIC

830-14

Want to keep this information? Tear along perforated edge.

NEW CHEVROLET TRUCKS

engineered and designed with your profit in mind!

Everything about these new Chevrolet trucks spells *profit!* Their low cost, their stamina and dependability, even their traditionally higher resale value!

COST LESS TO BEGIN WITH

That's right, Chevrolet brings you America's lowest-priced line of trucks—so you save right from the start. The beauty of it is, you go right on saving! With the high compression ratio of Chevrolet's three great engines, you register more miles on the job for each tankful of gas. You can count on fast starts; easy pulling up steep grades. You stay on schedule and keep the profits coming in *on time!*

COST LESS TO MAINTAIN

That's because of the rugged strength and stamina engineered into every new Chevrolet truck. They stay on the job longer (actual owner reports prove it!), cutting your maintenance costs right to the bone. Look over the many advance-design features in the next column and you'll begin to see why.

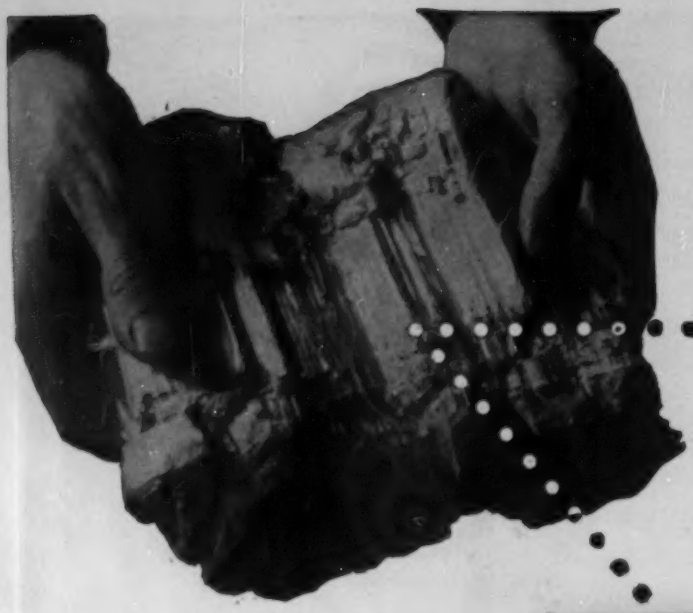
Your best bet is to talk trucks with your Chevrolet dealer. He'll tell you all you want to know about these Chevrolet profit-makers! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—positive-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **RIDE CONTROL SEAT***—eliminates back-rubbing. **LARGE UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give trip-saving load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

**Optional at extra cost. Ride Control Seat is available on all cabs of 1½-, and 2-ton models, standard cabs only in other models. "Jobmaster 261" engine available on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*



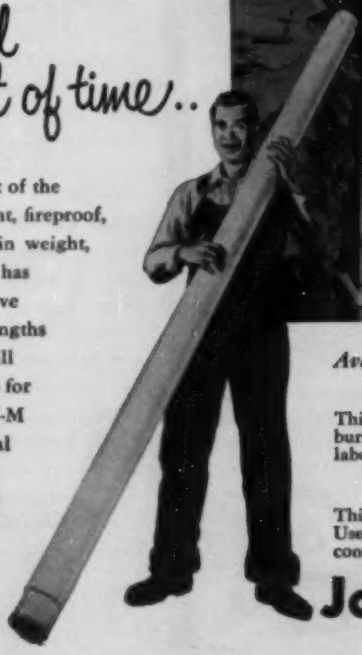
From the magic mineral

ASBESTOS

come these strong, durable

TRANSITE DUCTS

made to stand the test of time..



Transite* meets every requirement of the ideal duct material. It is permanent, fireproof, corrosion resistant, strong, light in weight, smooth-bored, non-inductive, and has rapid heat dissipation. No protective coating is required. The 10-foot lengths are rapidly assembled. Transite will outlast other duct materials. Write for new, free brochure showing how J-M Transite Ducts can effect substantial savings in both installation and maintenance of cable subways. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

Available In Two Types:

TRANSITE CONDUIT

Thick walled, used for exposed work, or buried without concrete casement saves time, labor, materials.

TRANSITE KORDUCT

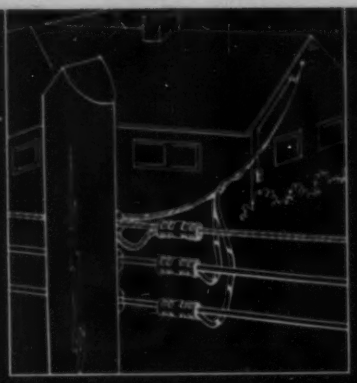
Thinner walled for installation in concrete. Used for high-voltage lines, its high thermal conductivity cuts operating losses.

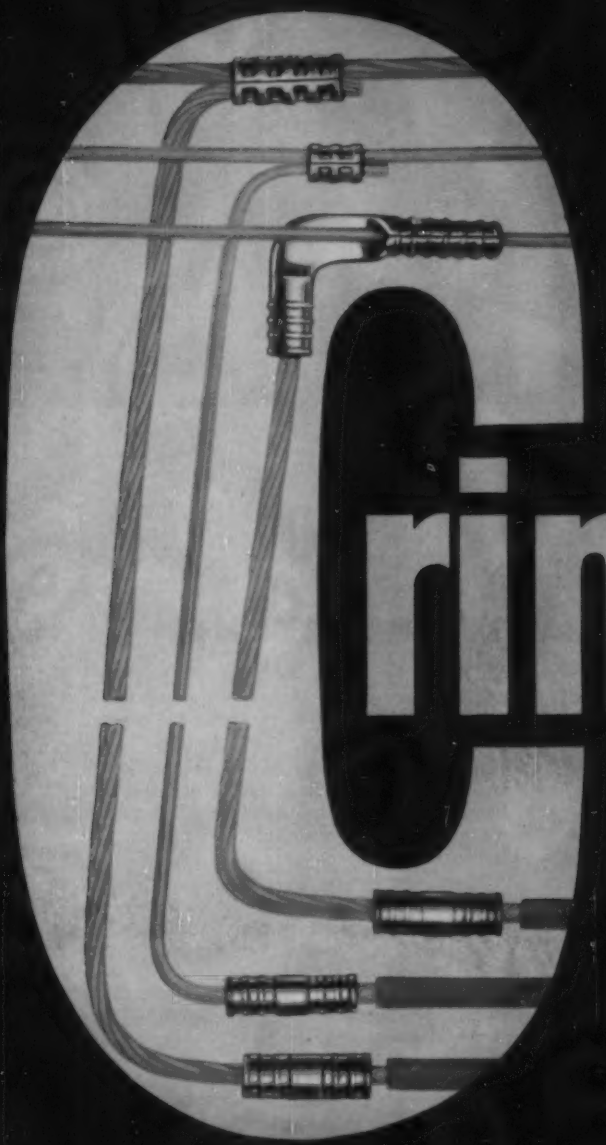
JM

Johns-Manville

*Trade mark registered

from pole to house entrance...





CORROSION FREE

Crimpit

COMPRESSION CONNECTIONS

Simplified hand or hydraulic installation tooling insures fast, fool-proof, economical connections with minimum investment in tools and dies. Write for Bulletin CR.

BURNDY

54-38

NORWALK, CONNECT. — TORONTO, CANADA • *Factories:* NEW YORK, CALIF., TORONTO • *Export:* PHILIPS EXPORT COMPANY

the Hotpoint Golden Anniversary

CUSTOMLINE BUILT-IN KITCHEN

With a high rate of new home construction assured in 1955 by the liberalization of FHA terms, plus a stepped-up desire for home modernization, utilities have a splendid opportunity to work more closely with builders and architects in promoting the *all-electric home*.

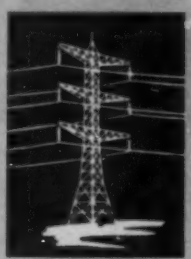
The built-ins included in the Hotpoint Customline Kitchen will allow families of more modest incomes to include these major electric appliances in their home mortgages. This opens up a whole new avenue for appliance sales and an important new source for *utility revenue*.

This new concept in electric living includes the NEW Hotpoint Customline Electric Range Ensemble composed of built-in Super Ovens, separate 4-Unit or 2-Unit Surface Sections, plus other exclusive features such as Deep-Well Thrift Cookers, Plug-In Calrod® Golden Fryers and Golden Griddles.

In addition, the Hotpoint Customline Kitchen includes the new built-in Hotpoint Super-Stor Refrigerator-Freezer and Automatic Dishwasher. All are finished in beautiful Satin Chrome and Spice Gold.

The versatility with which Hotpoint Customline Appliances may be utilized to permit the widest possible choice of personalized kitchen arrangements is limited only by the imagination of the individual. Have your Hotpoint Distributor show you, in detail, the many advantages Hotpoint Customline Appliances offer Utilities for *added revenue*.

Again, Hotpoint



looks at Tomorrow, Today!

HOTPOINT Co. (A Division of General Electric Company) 5600 West Taylor Street, Chicago 44, Illinois

ONE COMPACT UNIT

for on-the-spot insulating oil purification

Get complete, continuous purification of used transformer and circuit breaker oils—at reduced time, labor and maintenance costs—with HOFFMAN OIL CONDITIONERS.

ONE COMPACT UNIT — consisting of filter and vaporizer provides continuous, automatic reconditioning of used oils to "like new" condition without *down-time.*

Oil is freed of soluble and insoluble impurities. The vaporizer component eliminates volatile impurities such as diluents, air, water, gas . . . insures safe *dielectric strength.*

The cartridge filter component removes organic acids, resins, gums asphaltenes and other oxidation products.

Reduces sludge formation on coils and insulators—faster and more efficient than centrifuge or other conditioning methods.

HOFFMAN OIL CONDITIONERS are designed for central station installation or as mobile, truck-mounted units for field use. Capacities from 25 to 600 g.p.h.

Time, labor, space and cost savings *more than offset* purchase price.

HOFFMAN INDUSTRIAL FILTRATION ENGINEERS will be glad to survey your insulating oil conditioning needs, without obligation.

U. S. HOFFMAN
MACHINERY CORPORATION
INDUSTRIAL FILTRATION DIVISION
255 LAMSON STREET, SYRACUSE 6, N. Y.

U. S. HOFFMAN MACHINERY CORPORATION
INDUSTRIAL FILTRATION DIVISION • 255 Lamson Street, Syracuse, N. Y.

_____ Please send me your Bulletin 974 and Case Study #6
_____ Please have a representative call to survey our needs

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

APPROVED
-in all sizes
WESTON
Ruggedized
PANEL
INSTRUMENTS
(A-C • D-C • RF • THERMO)
1½"
APPROVED
VOLTS
A.C.
2½"
APPROVED
AMPERES
A.C.
3½"
APPROVED
MICROAMPERES
D.C.
4½"
APPROVED
Available in *all* standard panel instrument sizes, equipment designers now can specify ruggedized meters in the exact size required for any built-in equipment need. For complete information on WESTON Ruggedized Panel Instruments, including types and ranges available, communicate with the Weston representative in your vicinity, or write direct to . . . WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, N. J.
WESTON INSTRUMENTS

here's why GrateLite* is great!

eye comfort you can measure
300 F.C. with only
1.11 C.P./Sq. In. Brightness

and here are the figures to prove it . . .

Foot-Candles, Efficiencies, Brightness Readings

In our own showrooms we've installed a 15' x 16' GrateLite Ceiling. By switching on various lamp arrangements we can deliver from 28 to 300 foot-candles 7' 9" below the GrateLites. Measurements at right give GrateLite efficiency figures and brightness readings at 20° and 45° below the ceiling.

THESE FIGURES PROVE GRATELITE in a class by itself for modern high intensities, safely within comfort ranges plus a high degree of diffusion.

AREA: *15' x 16' (240 Sq. Ft.)*
GRATELITES: *Suspended 18" below ceiling*
FT.-CANDLES: *Taken 7' 9" below GrateLite*
BRIGHTNESS READINGS: *Taken with [illegible] Meter*
LUMINAIRES: *Guth M-5305/TO*
ROOM COLORS: *3 walls—light green—50% R. F. floor—15% R. F.*

Case No.	No. of 8' Lamps S. H. A.	Total Lamp Watts	Foot-Candles With Grateliter	Foot-Candles Less Lens	Eff. Watts Per Sq. Ft.	Brightness at 20°* F. L.*	Brightness at 20°* C. P. S. Per Sq. In.	Brightness at 45°* F. L.*	Brightness at 45°* C. P. S. Per Sq. In.
1	8 @ 300	2400	28	28	10	53	0.11	28	0.11
2	16 @ 300	4800	56	75	20	108	0.22	110	0.24
3	24 @ 300	7200	85	108	30	160	0.33	160	0.33
4	24 @ 430	10320	135	170	43	255	0.53	210	0.44
5	8 @ 300 24 @ 430	12720	165	200	53	310	0.65	250	0.52
6	16 @ 300 24 @ 430	15120	185	230	63	350	0.84	295	0.72
7	24 @ 300 24 @ 430	17520	210	260	73	395	0.91	340	0.77
8	40 @ 430	17200	240	310	72	455	0.84	510	1.15
9	8 @ 300 40 @ 430	19920	280	340	83	530	0.88	570	1.20
10	16 @ 300 40 @ 430	22320	305	380	93	575	1.04	650	1.37
11	24 @ 300 40 @ 430	24720	330	390	103	620	1.11	695	1.45

*F. L.—Foot Lamberts †C. P.—Candlepower *U. S. A. Con. Pow. Pond Tentative Regional

It's all in the sight-saving cubes—and only GrateLite has them!

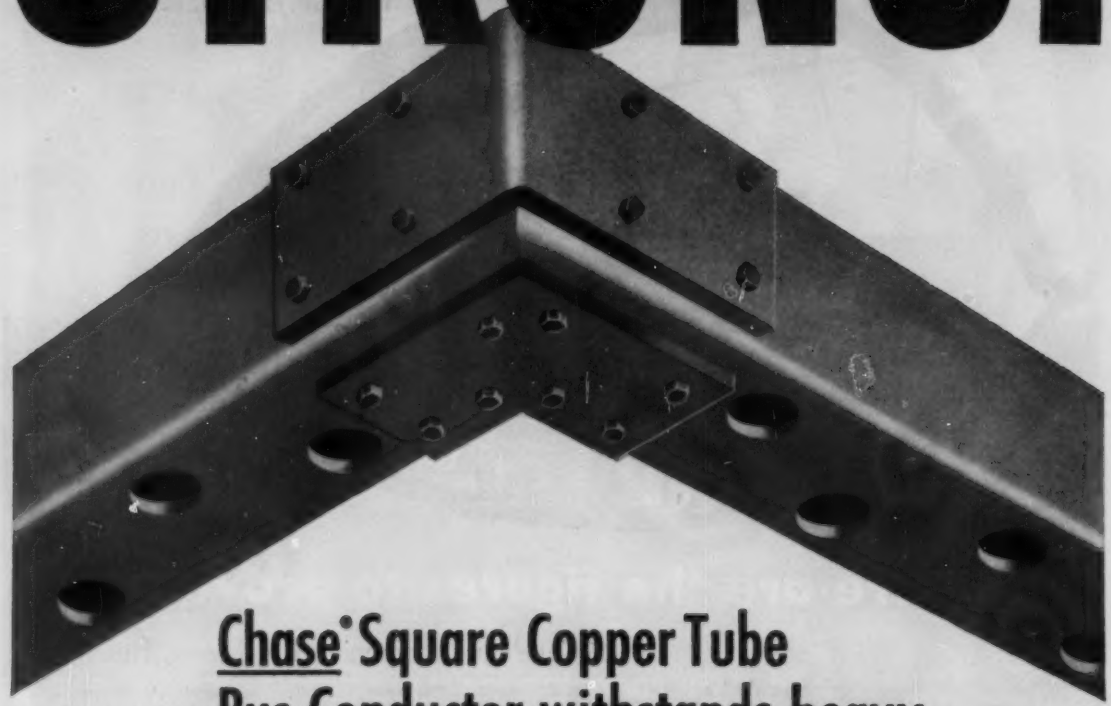
Send for free booklet "The GrateLite Story" Also "Glare Factors" and "Visual Comfort Indexes"

Guth

EDWIN F. GUTH CO. • ST. LOUIS 3, MO

Leaders in Lighting since 1902

STRONG!



Chase® Square Copper Tube Bus Conductor withstands heavy short circuit stresses, minimizes sag!

The square cross section configuration of Chase Ventilated Square Copper Tube Bus Conductor gives it the extra strength needed to withstand the stress of heavy short circuits . . . to permit longer spans between supports!

The heat-dissipating vent holes in Chase Bus Conductor that increase current-carrying capacity up to 20% *also* save you as much as *36%* in weight of copper in comparison with flat rectangular bus bar!

For full information about Chase Ventilated Square Copper Tube Bus Conductor, send for the free Chase Bus Conductor Brochure.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Detroit	Los Angeles	New York	St. Louis
Atlanta	Cincinnati	Grand Rapids†	Milwaukee	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Minneapolis	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(Sales office only)

Mr. James Lohr, Plant Superintendent (right), and Standard lubrication specialist, John Pirtle, inspect new 68,000 kw. generator. Initial fill of 3,905 gallons of NONPAREIL Turbine Oil was made on start-up date, December 7, 1953. A graduate engineer from Rose Polytechnic Institute, John has also completed Standard's Sales Engineering School. Customers of John's find his background and experience pay off for them.

Peak loads call for peak performance

Indianapolis Power & Light Uses NONPAREIL TURBINE OIL

Five turbines now operating at Indianapolis Power & Light Company's White River generating plant provide the bulk of the utility's more than two billion Kwh. annual production. The units have been using Standard's NONPAREIL Turbine Oil since their start-up dates. James Lohr, Plant Superintendent of the White River Plant gives these reasons why he likes NONPAREIL as the lubricant:

(1) NONPAREIL Turbine Oil is guaranteed for the life of the turbine.

(2) Periodic examination of the oil by Standard Oil laboratories for maintenance of quality.

(3) Using NONPAREIL means turbines are serviced with highest quality lubricant.

(4) NONPAREIL Turbine Oil has always done an excellent job.

NONPAREIL Turbine Oil is used in more than 800 turbines in the midwest—some for more than 25 years. While Indianapolis Power & Light Company's daily output is now about 7 million Kwh., generators have never been shut down because of lubrication failure. Neutralization number of NONPAREIL in the utility's generators is guaranteed never to exceed 0.15 mg. KOH/g. Regular analysis by Standard Oil laboratory assures acidity will be kept far below that, usually 0.03.

You may wish to know more about NONPAREIL Turbine Oil. In the midwest your nearby Standard Oil lubrication specialist will be happy to provide it. Or contact—Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

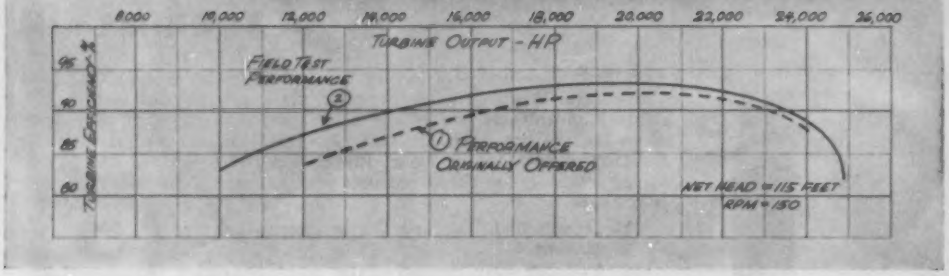
STANDARD OIL COMPANY
(Indiana)

STANDARD

Two SMS-Francis turbines at Tenkiller Ferry Dam on the Illinois River in Oklahoma are rated at 23,000 hp each under 132 feet net head.

Photo: Aerial Photo Service, Tulsa, Okla.

SMS
FRANCIS TURBINES



FIELD TESTS EXCEED PROPOSED PERFORMANCE AT TENKILLER FERRY DAM

Existing designs at the time of the proposal enabled SMS to offer the performance shown on Curve 1 (above) for the Tenkiller turbines which are of only medium size. Subsequent homologous model tests required by the Corps of Engineers led to improvements which were incorporated in the final design. These resulted in the performance shown by Curve 2, plotted from actual field tests made at 115 feet net head. Actual efficiency exceeded the initially proposed performance at all loads.

This illustrates that the outstanding performance of SMS products results from laboratory research as well as from specialized engineering and production. For information on SMS turbines and related hydraulic equipment, write to the S. Morgan Smith Company, York, Pennsylvania.

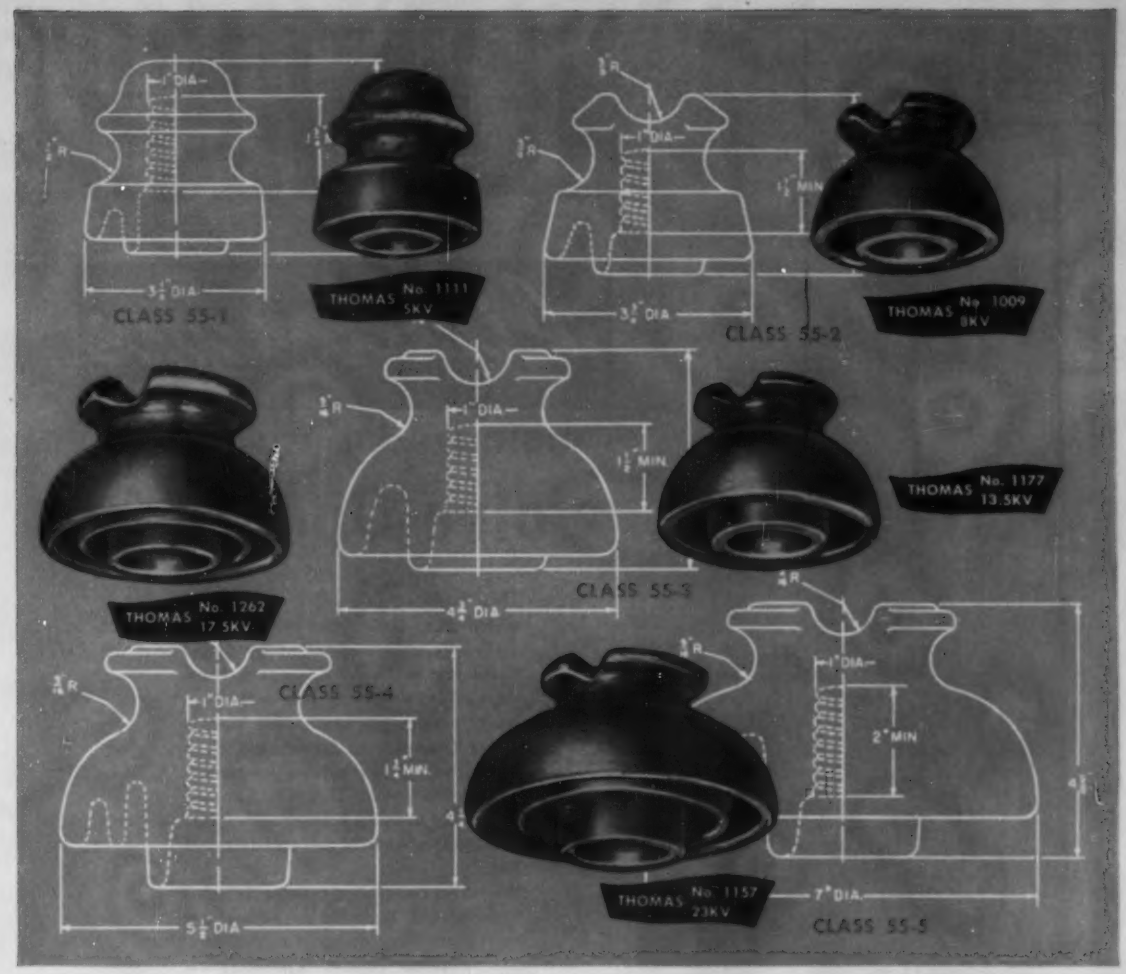
Hydraulic Turbines
Pumps
Gates & Hoists
Trash Rakes
Accessories

HYDRODYNAMICS

Rotovalves
Ball Valves
Butterfly Valves
Free-Discharge Valves
Controllable-Pitch Ship Propellers

S. MORGAN SMITH CO.

AFFILIATE COMPANY: S. MORGAN SMITH, CANADA, LIMITED, TORONTO



THOMAS makes all Five

EEI-NEMA STANDARDS show five designs of low and medium-voltage pin-type insulators. Although we catalog 22 pin-type designs, we are 100% behind any standardization that we believe helps the Industry. Therefore, we suggest that Users specify the five EEI-NEMA Standards for their low and medium voltage pin-type requirements.

Thomas insulators are backed by 82 years of ceramic experience and knowledge. Quality materials, precision manufacturing and PROOF OF PERFORMANCE make THOMAS porcelain the standard of comparison for discriminating engineers throughout the Electrical Industry.

Specify Thomas EEI-NEMA STANDARDS for your porcelain requirements. Insulators No. 1157, No. 1177 and No. 1262 are offered with the Thomas, Patented, Noise-Free, "Quiet-Type," under-glaze treatment at no extra cost. Simply specify the catalog number with the suffix "Q-T."

The R. Thomas and Sons Co.

1873 THOMAS INSULATORS RELIABILITY our 82nd year 1955

LISBON, OHIO

A "NEW HIGH"...

FOR

Limitorque®

motorized, push-button Valve Operation

This illustration shows an unique application of LimiTorque on one of six 24" gate valves supplied by Crane Company to Kaiser Engineers, Hanford, Washington. The extension spool permits the LimiTorque Electric Valve Operator to be located on a floor lever 15 feet above the centerline of the Valve. This is just one of the many unusual and effective applications of LimiTorque on Land and Sea.

Wherever convenient automatic valve operation is desired, or where an emergency may demand rapid, safe and positive remote operation — LimiTorque is the answer.

LimiTorque operates at the mere "push of a button" and thus, saves time, labor, and money required for manual operation of valves at distant or inaccessible locations. Further, LimiTorque opens and closes valves at the exact speed required, and it also "limits the torque" applied to valve operating parts, thereby preventing possible damage to valve stems, seats and discs. And too, the handwheel "cannot rotate" when the valve is being motor operated.

LimiTorque may be actuated by any available power source, such as Electricity, Oil, Gas, Water or Air; and is now available for Microwave control.

Send for new Catalog L-54.

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
LimiTorque Corporation - Phila.

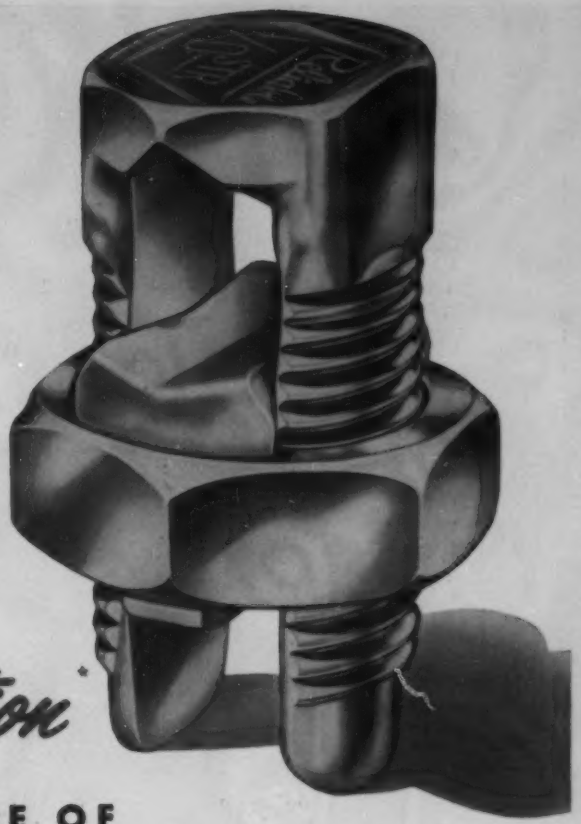
Industrial Gears & Speed Reducers

LimiTorque Valve Controls

Established 1892

Reliable

DESIGNS CONTROLS PERFORMS *Every Operation*



IN THE MANUFACTURE OF

Split Bolt Connectors

Forging tools and dies used in making Reliable Split Bolt Connectors are designed, made and maintained by long-experienced Reliable toolmakers.

Critical dimensions are held to close tolerances providing close thread engagement which assures constant pressure on conductors. Continuous inspection with precision tools guarantees that these close tolerances and consequent efficient performance are maintained at all times.

By making and inspecting all threaded parts and contacts in the same plant, Reliable provides Split Bolt Connectors that do a superior job under all conditions.

Reliable Split Bolt Connectors test for pressure, torque and strength well in excess of standards. Reliable cold forged connectors are listed under Re-examination Service, Underwriters' Laboratories.

* *BLANK NUT IS PURCHASED, BUT IS THREADED AND INSPECTED BY RELIABLE*

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

Reliable ELECTRIC COMPANY 3145 CARROLL AVENUE CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

ALL TYPES...ANY CLASS FIRE!

Since different fire hazards require different types of fire extinguishers, PYRENE—C-O-TWO manufactures all types . . . the finest and most complete line on the market today.

When doing business with PYRENE—C-O-TWO, you receive unbiased advice on what is best for your particular fire hazards, whether class A, B or C. Also, there is a well-rounded sales engineering organization having nation-wide representation to render top quality service wherever you're located.

Don't take unnecessary chances . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts now!

PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

It's the New JOSLYN

Stock No. J6780

*PATENT APPLIED FOR

For quick mounting transformers in various sizes or combination of sizes from 3 to 100 kva.

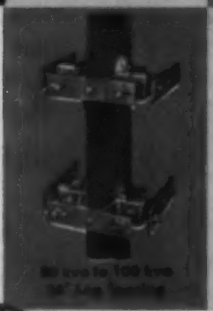
The J6780 Cluster Transformer Mount easily accomodates any combination of three transformers rated 3 kva to 100 kva.

Banded, one-piece yoke construction makes it easier to install than any other cluster hanger. Working time *up on the pole* is substantially reduced.

You can easily change out transformers. You do not have to bore any holes in the pole.

It is completely SAFE and will support loads *in excess of four tons.*

25 kva to 50 kva
24" Lug Spacing



3 kva to 15 kva
12" Lug Spacing

JOSLYN

Mfg. and Supply Co.

20 North Wacker Drive, Chicago 6, Ill.

TO: Joslyn Mfg. and Supply Co.
20 North Wacker Drive
Chicago 6, Illinois

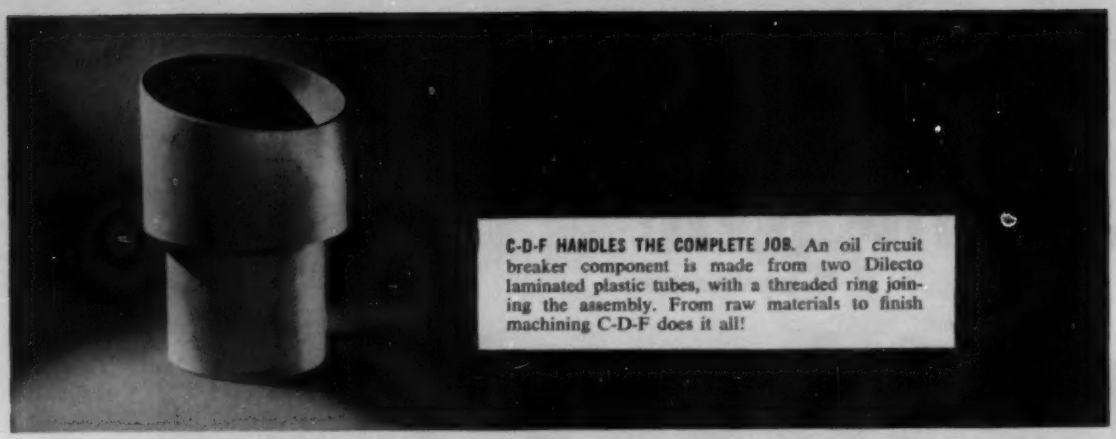
Please send me the folder which completely describes the New Joslyn Cluster Transformer Mount.

NAME_____

COMPANY_____

STREET_____

CITY_____ STATE_____



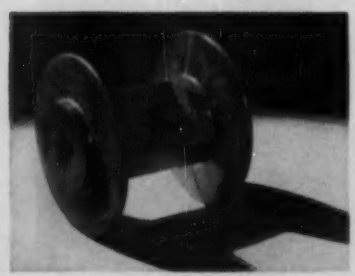
C-D-F HANDLES THE COMPLETE JOB. An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!

C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.

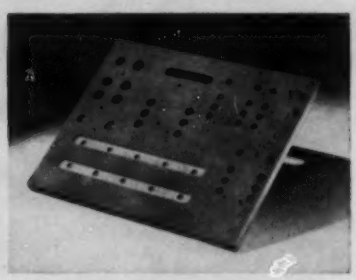
C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

DEPENDABLE equipment RELIES on C-D-F INSULATION!



C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



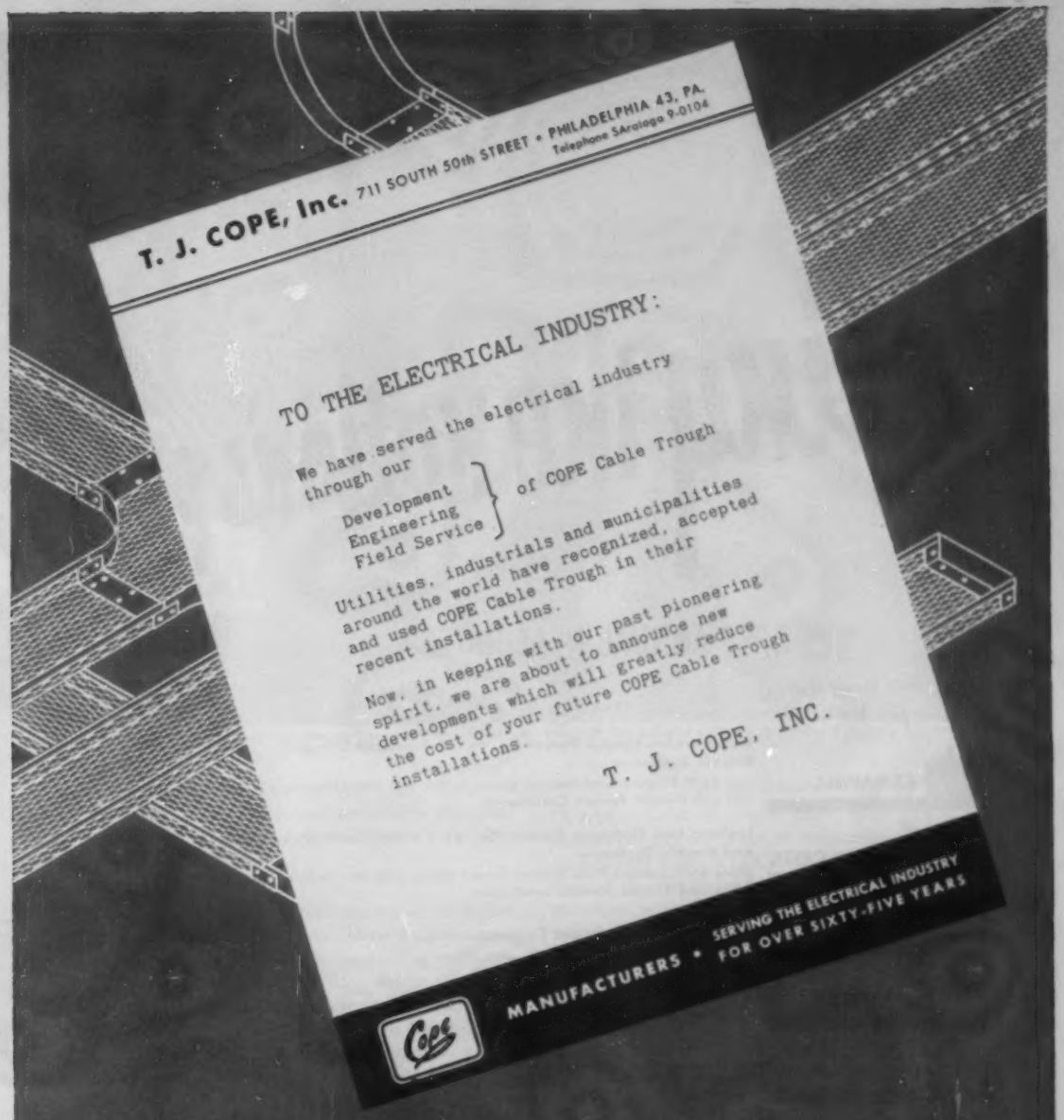
C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CDF *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 15, DELAWARE


T. J. COPE, Inc. 711 SOUTH 50th STREET • PHILADELPHIA 43, PA.
Telephone SAratoga 9-0104
TO THE ELECTRICAL INDUSTRY:
We have served the electrical industry through our
Development
Engineering
Field Service
of COPE Cable Trough
Utilities, industrials and municipalities around the world have recognized, accepted and used COPE Cable Trough in their recent installations.
Now, in keeping with our past pioneering spirit, we are about to announce new developments which will greatly reduce the cost of your future COPE Cable Trough installations.
T. J. COPE, INC.
MANUFACTURERS • SERVING THE ELECTRICAL INDUSTRY FOR OVER SIXTY-FIVE YEARS
Cope

WATCH FOR IT SOON IN THIS MAGAZINE

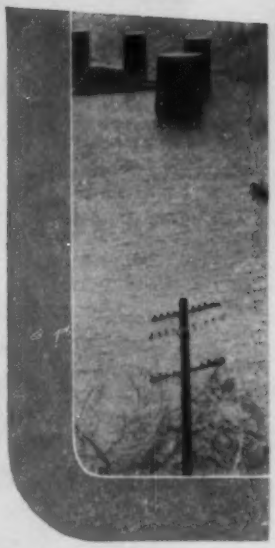
You also know Cope by these products

Cope

T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

Pacing the nation's power



10 BEST ANNUAL HEAT RATES

(Plant Net Heat Rates)
Btu per kwhr*

9170	KANAWHA	**Appalachian Electric Power Co. on the American Gas and Electric System—** Two B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.
9329	TANNERS CREEK	**Indiana and Michigan Electric Co. on the American Gas and Electric System—** Three B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.
9418	ALBANY	**Niagara Mohawk Power Corporation.**
9454	SCHILLER	**Public Service Co. of New Hampshire—** Two B&W-built Mercury Boilers.
9510	DUNKIRK	**Niagara Mohawk Power Corporation.**
9540	J. R. WHITING	**Consumers Power—** Three B&W Radiant Reheat Boilers.
9594	PHILIP SPORN	**Appalachian Electric Power Co. and The Ohio Power Co. on the American Gas and Electric System—** Four B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.
9630	ST. CLAIR	**Detroit Edison Co.—** Four B&W Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.
9661	EASTLAKE	**The Cleveland Electric Illuminating Co.**
9815	ASTORIA	**Consolidated Edison Co. of New York, Inc.—** Two B&W Pressure-Fired Radiant Reheat Boilers with Gas Recirculation and Divided Furnace Construction.

* Federal Power Commission figures

Appalachian Electric Power Company's Kanawha River Plant on the American Gas and Electric Company System.

Headed by a record 9170 Btu per net kwhr, these ten plants were the most efficient central stations in the country during 1953, the most recent year for which complete heat rate data are available.

Reflecting the decision of the electric companies to utilize the most recent engineering advances, even during a time of critical capacity expansion, the outstanding performance of these modern plants is a tribute to the foresight of the whole industry. It affords one more indication that the prime interest of this unique team of electric companies and their major suppliers lies in producing still lower-cost kilowatts for a still greater America.

B&W Boilers in many of these stations are designed with such advances as Pressure-Firing, Cyclone Steam Separators, Gas Recirculation and Divided Furnace Construction — features which have contributed substantially toward the outstanding efficiency levels achieved. Also, all steam generating units are equipped with reheaters, a development of major importance in improving plant efficiency.

Pressure-Firing

Among the many advantages of this important engineering advance, as utilized, for example, by the Kanawha River units, is elimination of air infiltration to reduce stack loss and assure greater efficiency. Maintenance is reduced and the use of forced-draft fans alone means easier starting, smoother operation and simpler controls. These are the reasons why more than 100 Pressure-Fired B&W units are now in service or under construction.

Cyclone Steam Separators

Operating inside the steam drum, these simple, stationary devices require no power or maintenance and do not take up building room. The Cyclone Separators assure positive natural circulation at high pressure, and with the steam scrubbers, make it possible to send steam of highest purity to the turbine. Consequently, turbine efficiency is maintained and turbine outages reduced.

Divided Furnace Construction

With this B&W construction, building volume is held to a minimum. Both sides of the furnace division wall are used to absorb heat and thus make it possible to achieve the required furnace cooling surface without excessive increase in building volume.

* * * * * *

The record heat rates set by these leading generating stations are closely followed by those of many more plants across the country which are producing low-cost kilowatts at efficiency levels unattainable just a few years ago. And B&W is continuing to devote its energies and its long-accumulated experience to the development of boiler designs that will contribute to still higher levels of steam generating efficiency. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX
BOILER DIVISION

G-696

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-1, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

There IS a Difference!

Connectors may look alike but it's PERFORMANCE that counts

BLACKBURN CONNECTORS OUT-PERFORM THEM ALL

Because They Are...

BETTER MECHANICALLY

- Made of high strength duronze, a silicon bronze alloy stronger than structural steel.
- Machine cut threads, *CFC treated, provides more thread engagement —reduces friction and increases thread efficiency. *Chemical Friction Control.
- Rigid inspection of each production operation assures uniformly good connectors.

BETTER ELECTRICALLY

- High clamping force—the result of greater thread efficiency breaks down oxide on the conductor improving conductivity.
- Higher initial conductivity, actually greater than an equal length of conductor is maintained permanently.

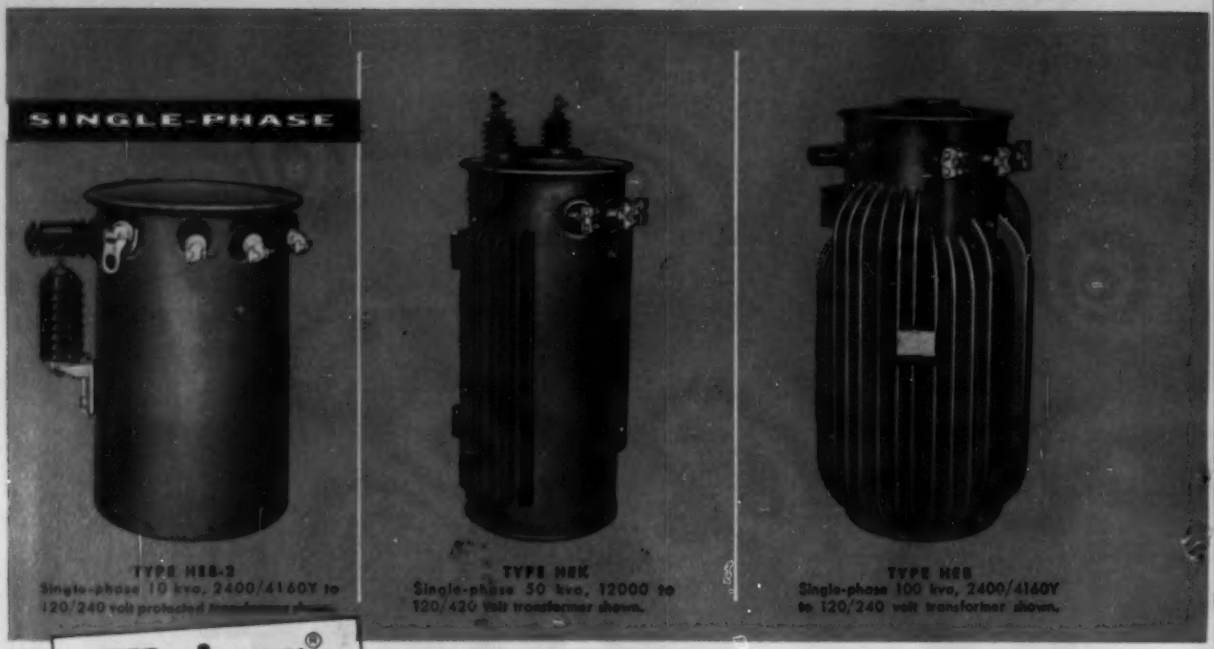
REUSABLE

- Selection of proper high-strength, corrosion-resistant materials—plus precision workmanship and inspection—means Blackburn connectors may be used over and over.

BLACKBURN *Hi-Strength* **CONNECTORS**

AVAILABLE AT ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORP., 35 Madison Street, St. Louis 6, Missouri • Phone MAin 1-2821


SINGLE-PHASE
TYPE HSS-2
Single-phase 10 kva, 2400/4160Y to 120/240 volt protected
TYPE HSK
Single-phase 50 kva, 12000 to 120/420 volt transformer shown.
TYPE HSB
Single-phase 100 kva, 2400/4160Y to 120/240 volt transformer shown.

Wagner®
TRANSFORMERS
...the choice of leaders in industry

When it comes to

WAGNER WILL MEET YOUR REQUIREMENTS!

The Wagner line of Distribution Transformers, that meets *all* EEI-NEMA Standards—will also meet *all your* requirements, no matter how varied they may be. Wagner Distribution Transformers are available in all standard kva ratings and voltages.

If you want a 3 kva, pole-type transformer—Wagner has it. If you want a 150 kva, vertical-type transformer, Wagner has it, too. But these are requirements more in the nature of specifications. We're sure you have *other* requirements for the transformers you buy—such as dependability . . . long service-life . . . maintenance-free performance. Setting high standards for quality materials and careful workmanship are *additional* requirements met by Wagner Distribution Transformers.

Then there are the *extra* features of Wagner Distribution Transformers . . . like the Wagner Shur-Seal Clamping Ring, the high voltage side-wall bushing, the locked low voltage bushing and the Wagner Form W element. *All* Wagner Distribution Transformers are filled with inhibited oil to reduce oxidation and retard the formation of acids and sludge.

You get quick delivery, too. Wagner's expansion program has provided a new plant, devoted exclusively to the manufacture of transformers, to help meet the growing demand for Wagner Transformers. In addition, Wagner has a nation-wide organization to provide fast, convenient service—with branches in 32 principal cities.

Get in touch with your nearby Wagner branch today. Write for your copy of Bulletin TU-180. It gives complete information on Wagner Distribution Transformers.

TYPE HPK
Three-phase 225 kva, 7200 to 240 x 480 volt transformer shown.

TYPE HPB (Vertical)
Three-phase 112.5 kva, 2400 to 208Y 120-volt transformer shown.

TYPE HPB
Three-phase 75 kva, 2400 to 240 x 480 volt transformer shown.

Distribution Transformers...

HIGH VOLTAGE SIDEWALL BUSHING

This high voltage sidewall bushing permits *faster* connections because the conductor is simply pushed into the connector and tightened with a few turns of the knob... *easier* because no tools are needed... are *safer* because the knurled knob is insulated to protect the lineman from accidental shock.

LOCKED LOW VOLTAGE BUSHING

These bushings are keyed to prevent rotation. The porcelain is keyed to the tank and the metal stud is keyed to the porcelain. There can be no loose connections on the inner end of the terminal studs because it is impossible for these studs to turn when the terminals are being tightened.

SHUR-SEAL COVER

Covers of pole-type transformers with round tanks are sealed to the tank with the Wagner Shur-Seal Clamping Ring. "Breathing" is completely prevented and no loss of oil can occur at any time. The Shur-Seal ring maintains equal pressure all around the cover—yet the cover may be easily removed by loosening a single, stainless steel bolt.

Wagner FORM W ELEMENTS

All Wagner single-phase distribution transformers in ratings 500 kva, 15 kv and below, are furnished with Wagner Form W core and coils which permit a liberal design in small size, lightweight transformers and which give excellent electrical performance.

T50-4

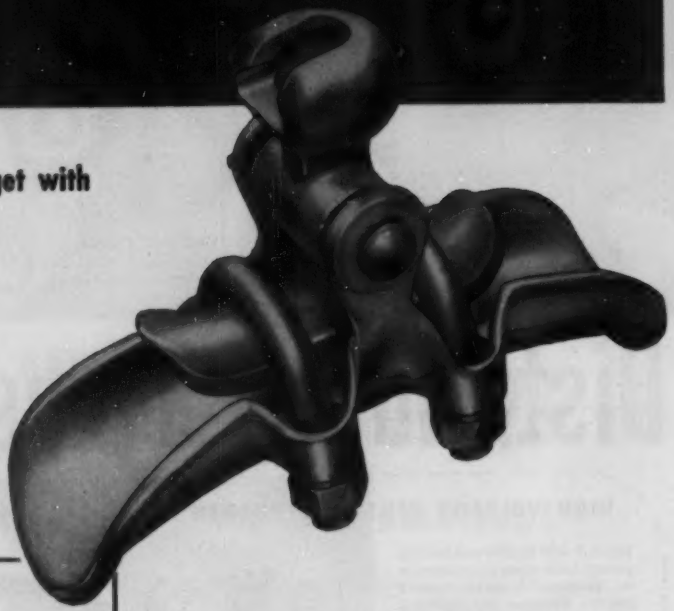
WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

Wagner Electric Corporation EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

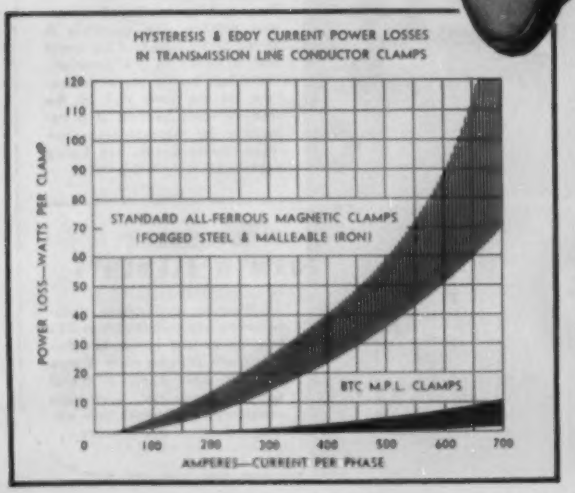
Minimum Power Loss



One of the basic advantages you get with

BTC

Drop Forged M.P.L. ALUMINUM Suspension Clamps



IT'S A FACT...

The use of a non-magnetic Aluminum Clamp Body reduces eddy current and hysteresis losses to a minimum. At the same time, it prevents temperature rise in clamped section of the conductor, which will operate at lower temperature than in the span.

THIS IS JUST ONE of many reasons why it pays to use BTC drop forged M.P.L. Aluminum Suspension Clamps on your transmission lines. Specify these performance-proved BTC Clamps the next time you order from your insulator manufacturer!

Sold Through Your Insulator Manufacturer Only.

Drop Forged BTC *Hi-Line Hardware*

The BREWER-TITCHENER *Corporation*

Cortland • New York

ARE YOU HAUNTED

BY OLD-TYPE, LOW-INTERRUPTING-CAPACITY SWITCHGEAR

Complete replacement of Metal-Clad Switchgear is often hard to justify to management because of its expense; consequently, many engineers are haunted by the dangers of obsolete equipment having low interrupting capacity.

NOW You can put new life into EXISTING CUBICLES

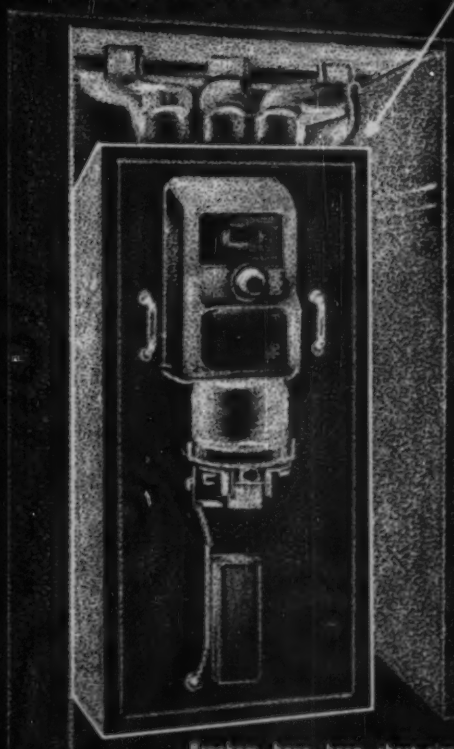
—with a minimum of cost

—with a minimum of trouble

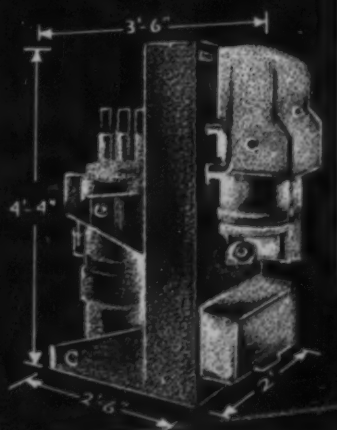
—by installing NELSON REPLACEMENT UNITS

Write for details about this modern, standardized, vertical-lift, metal-clad circuit breaker of proven high interrupting capacity.

RETAIN THE CUBICLE — REPLACE OLD BREAKERS WITH NELSON REPLACEMENT UNITS



Breakers have been short-circuit tested under very severe conditions.



RATINGS FOR NELSON CIRCUIT BREAKERS

2300, 4160, 4800, 7200 and 13,800 volts; 50 to 500 MVA interrupting capacity; 600 - 1600 amperes continuous

COMPACT DESIGN of the Nelson replacement unit usually allows existing structure to be used.

EASY TO INSTALL AND SERVICE. This packaged unit consists of a cubicle, and a modern breaker mounted on withdrawable truck, fully interlocked.

NELSON *Electric* MANUFACTURING CO.

TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 3-3131

For any splicing or insulating job—
there's a "U. S." Tape

HOLDTITE® FRICTION TAPE

This is the strong, tacky tape that really grips and stays on. The fabric has unusually high tensile strength to handle *any* electrical or general purpose job. Non-ravelling, straight-tearing. No pinholes to cause leaks. U.S. Holdtite exceeds A.S.T.M. Specifications.

HOLDTITE RUBBER TAPE

For durable splices on all general electrical work. Holdtite is an unvulcanized rubber splicing compound with high tensile strength, high elongation and tackiness plus dielectric strength. Electricians like its "feel". Easy to handle, pulls down tight and *fuses* quickly into a solid mass without heat or undue pressure. Insures long-aging splices. U. S. Holdtite exceeds A.S.T.M. Specifications.

ROYALASTIC PLASTIC TAPE

For making a thin splice and keeping wiring neat and uncluttered, many maintenance men find Royalastic is best. It does the work of both rubber and friction tape in many uses. Complete mechanical and electrical protection. High tensile strength and excellent resistance to abrasion and to water, oils, acids, alkalies and corrosive chemicals. Good stretch, pulls down tight, stays on. Approved by Underwriters' Laboratories, Inc.

US RUBBER

When you need industrial tape, simplify your purchasing by ordering from a single source—one of our numerous distributors or direct from one of our 27 District Sales Offices. Put your order in now.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

What it Takes to Pipe the Atom

No power piping or chemical process piping job is too large or complex for The M. W. Kellogg Company. At the AEC's billion-dollar gaseous diffusion plant, Paducah, Kentucky, it entails the installation of 3,450,000 feet of tubing and pipe for the main process, auxiliary, and instrument piping, and represents 17,500,000 total man-hours—850,000 engineering, 2,600,000 welding. M. W. Kellogg also will test the system prior to use.

M. W. Kellogg's responsibility started long before a single length of pipe could be put in place. It included an on-the-site welding school—to help all contractors master unfamiliar techniques, and a temporary pipe fabricating and fitting shop costing one million dollars. Once work was started, the control system to prevent product contamination was so strict that not even a thumbprint was allowed on the interior of the pipe.

The size and complexity of the Paducah assignment . . . the outstanding labor relations and safety records achieved . . . help explain why The M. W. Kellogg Company is pre-eminent in the engineering and construction of jobs ranging from public utility piping systems to complete refineries and chemical processing plants.

M.W. Kellogg

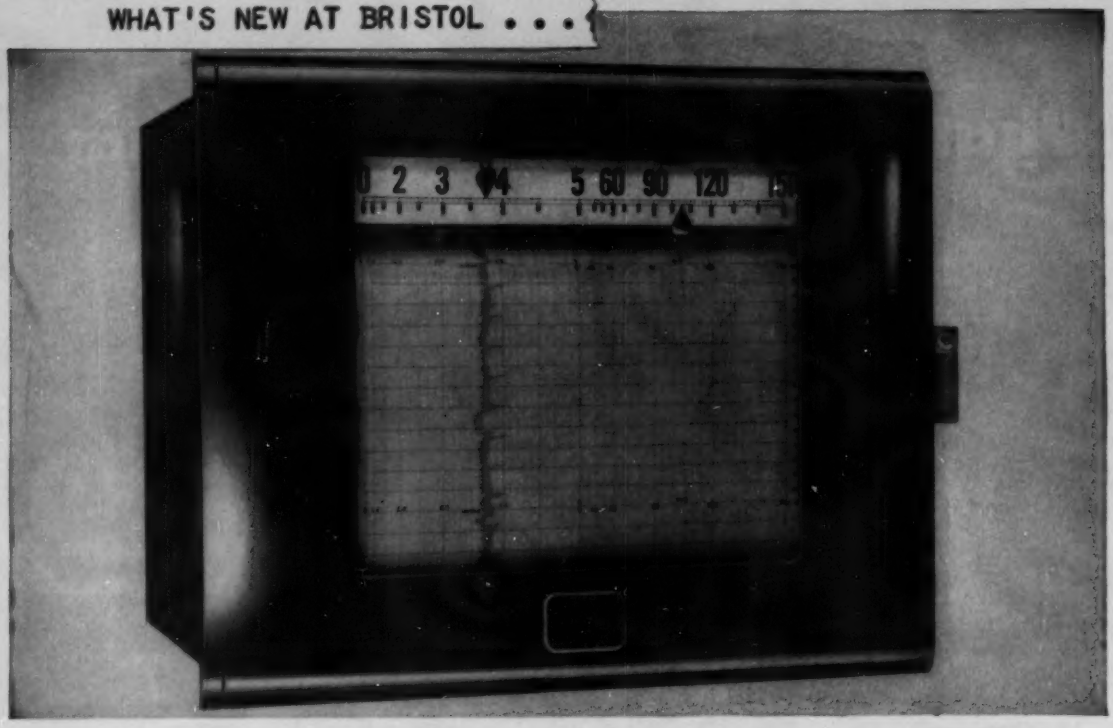
ENGINEERING FOR TOMORROW

THE M. W. KELLOGG COMPANY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Limited, Toronto • Kellogg International Corporation, London.

SUBSIDIARIES OF PULLMAN INCORPORATED

WHAT'S NEW AT BRISTOL . . .



Record current and voltage on one chart

with Bristol's Electronic Dynamaster Recording Voltmeter-Ammeter

THERMAL CURRENT and thermal voltage converters used with the Dynamaster Recording Voltmeter-Ammeter.

This two-pen strip-chart potentiometer records voltage and current simultaneously on the same chart. Measurements are made from a thermal voltage converter and a thermal current converter — a-c/d-c transducers with extremely high response speeds.

Here's what you get in this voltmeter-ammeter:

Accurate measurement: The Dynamaster is an accurate electronic instrument of simple, rugged construction. It is well suited for central station use under severe operating conditions, as well as for research and laboratory use.

Fast response: 2 seconds for full range pen travel. Every variation is recorded. Measurement is continuous.

Improved chart record: Two-zone, 12-inch strip chart with 11-inch calibrated width. Records are side-by-side — easy to read and compare, with expanded scales in the operating ranges. Chart speeds from ¾-inch per hour to 4-inches per second.

Kilowatt and Kilovar recorder: The Dynamaster is also available, using Bristol Thermoverter Transducers (thermal watt converters) as the primary elements, for recording watts and vars on a single two-zone chart.

Write for more information to The Bristol Company, 116 Bristol Road, Waterbury 20, Conn. 4.31

BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Get easy "summer operation" all winter long with KEARNEY DISCONNECT SWITCHES

Group Operated Rotating Insulator Type

SIDE BREAK

7,500 to 69,000 volts
400 and 600 amperes

Only 2 moving parts. Heavily constructed and bearing supported to insure alignment through years of service.

VERTICAL BREAK

7,500 to 69,000 volts
400 Amps., 7.5 KV to 34.5 KV
600 Amps., 7.5 KV to 69 KV
1200 Amps., 7.5 KV to 69 KV

Only 3 moving parts. Simple, rugged, and completely adjustable for right or left-hand installation.

Features:

- Positive current transfer from blade to line terminals through weather-protected high pressure contacts.
- Powerful tubular blade of electrolytic hard drawn copper, balanced and aligned.
- Easy adjustment for phase synchronization.
- No flexible shunts.
- Oilite bearings for easy operation.
- Both ends of blade seat in silver overlay contacts. No current transfer through hinge bearings on the rotating switch.
- Weather-sealed blade adjustments on side break switch.
- Ice-breaking, rotating jaw contact controlled by blade movements on side break switch.
- No springs or cams.

For Better Construction — Safer Maintenance

ENGINEERED TO OPERATE UNDER THE TOUGHEST ICING CONDITIONS

When you need them most they're on the job! These trouble-proof switches are ready to operate regardless of weather.

Smooth-operating, cool-running and corrosion-resistant, Kearney Rotating Insulator Switches bring you the utmost in modern disconnect switch performance.

Write today for complete information.

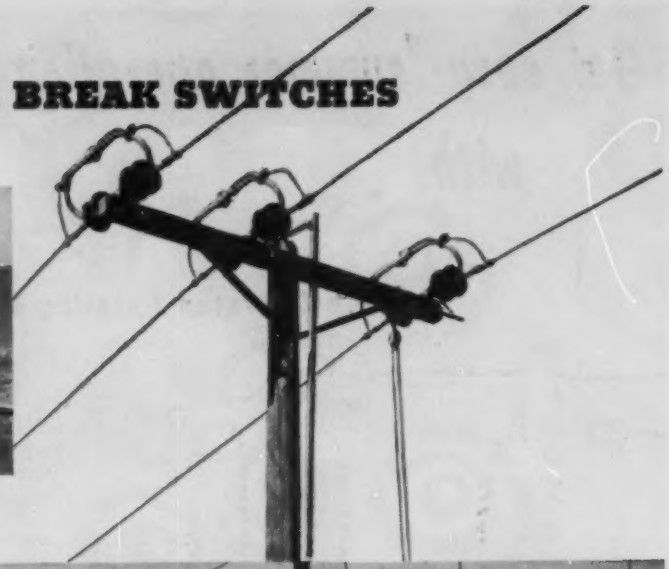
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Mo.
Canadian Plant: Guelph, Ontario

880

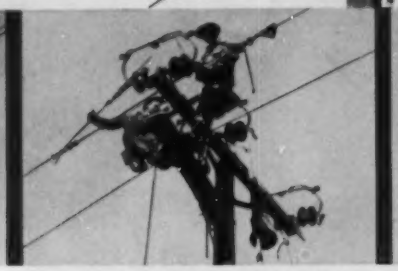
Specify **KEARNEY Products**

KPF AIR BREAK SWITCHES

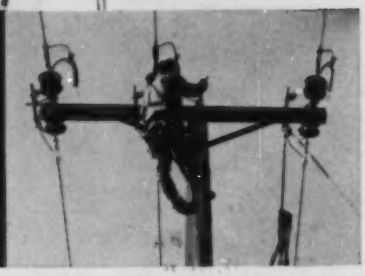
1 Sturdy factory-assembled phase units are bolted to cross-arm and push-pull interphase control rods installed on the ground. (Installation is equally simple in the air on installed cross-arms.)



2 At pole top, linemen receive switch bolted to cross-arm and ready to install on pole. Simple design and use of quality materials means KPF phase units are rugged, yet amazingly light weight.



3 Cross-arm bolted to pole, braces and first section of control rod installed. Linemen connect conductors quickly and easily to any standard strain clamp and dead-end direct to phase units.



4 Conductors connected, crank arm being adjusted on push-pull interphase control rod. Like KPF switches and Quick-Breaks, KPF controls need no lubricating. They crack off any icing, are never affected by cross-arm warpage.

Time-tested KPF switches install simply, easily—in 1/2 normal time

KPF switches—the switches that look different because they *are* different—install differently, too. Experience of leading Western power companies shows that KPF switches are normally installed in ½ the time required for complex, cumbersome ordinary equipment. Each KPF phase unit is light weight, readily handled by one man. No extra cross-arms or special supporting structures are needed. Each phase unit is fully assembled, tested and adjusted at the factory. The unit is ready to operate when it reaches the job—no waste of lineman's time. Dependable KPF switches may be mounted horizontally, vertically or triangularly with equal success and long-term, trouble-free service.

For the world's simplest, surest, lowest cost air break switch, specify KPF—standard for nearly 50 years.

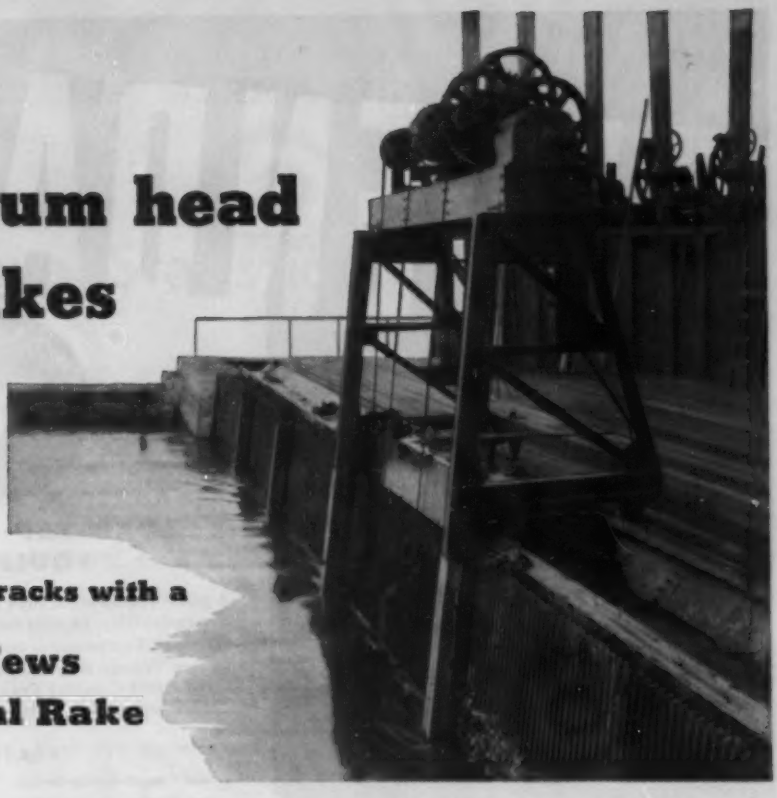
5 Installation complete. Lineman installs operating lever and last section of control rod. Note the neat, clean pole top appearance of KPF switches—a familiar sight throughout the West on such famous systems as PG&E, Southern California Edison and others.

KPF
AIR BREAK SWITCHES
Standard for nearly half a century

New catalog gives complete specifications, detail drawings, installation data.

KPF ELECTRIC COMPANY
1624 East Alpine Avenue, Dept. E, Stockton 5, California

Gain maximum head at Intakes



...by cleaning your racks with a

Newport News Mechanical Rake

Keeping racks clean is essential wherever a few inches of head loss can reduce output of the wheels.

One company calculated the capitalized value of each inch of head gained at its plant as $6,000. Measured in terms of the value of additional power output, a Newport News rack rake installed at this plant is paying for itself over and over again the year 'round.

Power-operated to clean trash racks at water intakes of hydroelectric plants, steam plants, pumping stations, canals and similar installations, the Newport News Mechanical Rack Rake reduces a major hand-labor task to one of minor periodic activity.

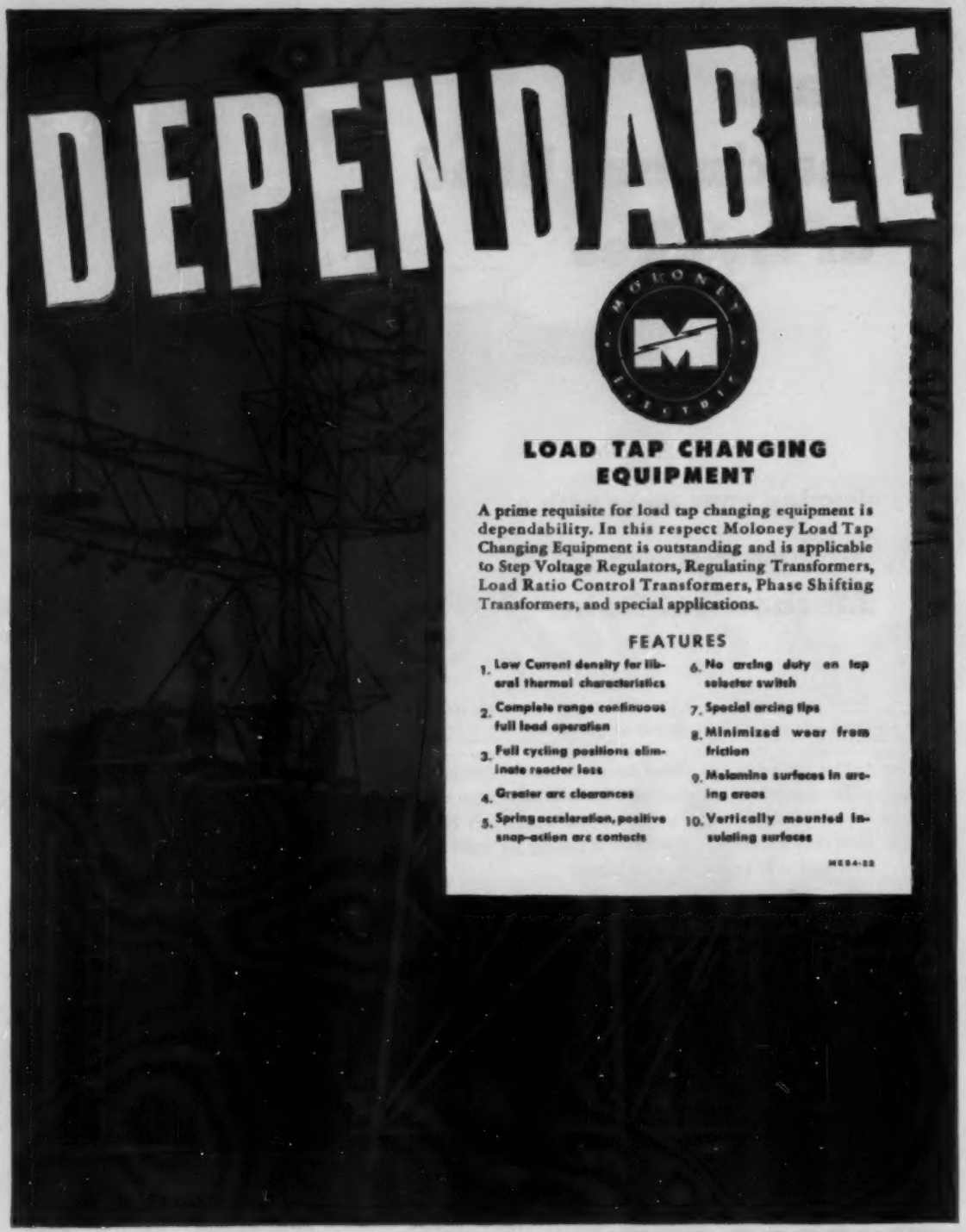
Under ordinary conditions, one man per shift can, with a Newport News Mechanical Rack Rake, keep the racks clean for a dozen bays.

Write for your copy of "RACK RAKE," an illustrated booklet describing the operation and advantages of the Newport News Mechanical Rack Rake. Use the convenient coupon now.

NEWPORT NEWS
Shipbuilding and Dry Dock Company
Newport News, Virginia

Newport News Shipbuilding and Dry Dock Company
Dept. EW--1-24, Newport News, Virginia
Please send me a copy of "RACK RAKE."

Name _____ Title _____
Company _____
Address _____
City _____ State _____



LOAD TAP CHANGING EQUIPMENT

A prime requisite for load tap changing equipment is dependability. In this respect Moloney Load Tap Changing Equipment is outstanding and is applicable to Step Voltage Regulators, Regulating Transformers, Load Ratio Control Transformers, Phase Shifting Transformers, and special applications.

FEATURES

1. Low Current density for liberal thermal characteristics
2. Complete range continuous full load operation
3. Full cycling positions eliminate reactor loss
4. Greater arc clearances
5. Spring acceleration, positive snap-action arc contacts
6. No arcing duty on tap selector switch
7. Special arcing tips
8. Minimized wear from friction
9. Melamine surfaces in arcing areas
10. Vertically mounted insulating surfaces

ME84-33

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Annual Statistical Issue

This is Electrical World's 51st annual Statistical Issue—a review of the status of the electrical industry. Herein are detailed the accomplishments of the industry. And from EW's own construction surveys are data on utility expansion in 1954 and that planned for the years immediately ahead. We are again proud to present this unique service.

For industry in general 1954 was a second-best year. But in important respects it was the best year for electric utilities. Here are some of the records:

- Production, sales, and revenues reached new highs—around 7% above 1953.
- Customers totalled 51 million—up one million during the year.
- Consumption of electricity in the average home reached 2,540 kwhr—a jump of 195 kwhr over the previous year and the largest annual increase in the history of the industry. During the same period residential sales climbed 11.4%, and unit cost of electricity per customer was 1.8% below 1953.
- Use of coal for steam generation was brought down to an average of 1 lb per kwhr from 1.06 lb.

The new peaks were registered by the utility industry in the face of the recession suffered by other segments of the electrical industry. Electrical manufacturers reported shipments off 5% from 1953. Appliance sales were below 1950 and 1953 levels.

Statistics in this issue do reflect the business turndown in several ways. Rate of growth of power sales over 1953 was only half the comparable figure for a year earlier. Over all expenditures for capital expansion of utility systems decreased from $4,063,573,000 in 1953 to $4,015,669,000 in 1954.

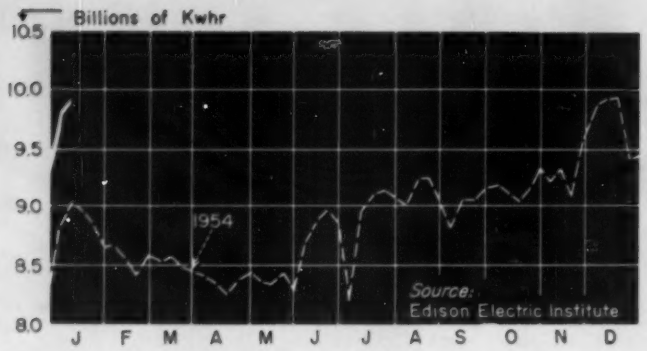
Results of EW's construction survey show a cutback in expenditures for generation in 1954 which is expected to continue in 1955. Spending for distribution and transmission construction was up in 1954 over the previous year. Prospect is for continued gains in distribution expenditures with transmission remaining about the same as in 1954. Over all utilities plan to spend $3,859,060,000 for capital expansion in 1955.

Technological improvements made in generating and other equipment during the past few years are paying off. Operating ratio of the industry went to 45.1% in 1954 as compared with 47.2% in 1953. This is the lowest level since 1946 when the ratio 44.4% was registered.

For a detailed statistical picture of the industry today and its plans for the immediate future, we commend to you the 48-page report beginning on page 125.

THE ELECTRICAL WEEK

LAST MINUTE



Week Ended Jan. 15

9,928,000,000

Up 10.1%

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mountain	Pacific NW	Pacific SW
Jan. 15	+10.1	+2.9	+3.1	+8.0	+2.5	+22.2	+8.5	+7.8	+11.9	+7.9
Jan. 8	+11.4	+4.0	+5.1	+9.2	+5.2	+21.0	+12.6	+10.9	+13.4	+9.6
Jan. 1	+15.0	+9.6	+7.4	+15.2	+7.9	+23.1	+12.3	+11.5	+12.2	+13.0

Seasonally Adjusted Index 179.6 Week Ago 177.1 Year Ago 163.1

The Issue's News Highlights . . . Retiring Gov James F. Byrnes calls for investigation of finances of South Carolina Public Service Authority . . . Southwestern Power Administration files revised rate schedule to boost its revenues with FPC . . . Eisenhower budget proposes one-third cut in expenditures for federal power program in fiscal 1956 . . . New subcommittee is established by House Appropriations Committee to handle funds for federal power agencies.

A decision on Clark Hill power situation is "critical for us in our system planning," says Georgia Power Pres Harllee Branch Jr, commenting on Interior Secretary Douglas McKay's latest statement in this matter. McKay says he is "in no hurry" to make a decision and is "considering another approach." But, he has declined to give details. Georgia Power had sought decision by Jan. 1.

Several recent turbine-generator orders, along with transformers and switchgear, have been placed on bids that are reported to be considerably below published manufacturer's prices.

Fighting to keep PUDs out of Priest Rapids project, Washington's Gov Arthur B. Langlie says "there is no valid reason any city or PUD should be building power dams to serve region-wide consumer potential." He has asked legislature for $1 million to permit State Power Commission to undertake preliminary work on project. Commission also will ask for $275,000 loan for engineering design of two 150,000-kw steam-generating plants to cost $45 million. Meanwhile, state Democrats have introduced bill to abolish commission.

Massachusetts Department of Commerce has begun to keep monthly records of electrical energy used as a substitution for manpower by manufacturing industries. Figures show that while there was 14% drop in man-hours during first 10 months of 1954, electrical consumption was down only 5.4% . . . Rhode Island House of Representatives has passed bill requiring utilities and common carriers to pay 45% of cost of operating state public utility administrator's office.

Sangamo Electric has entered power capacitor field with introduction of Sangamo Diaclor Power Capacitors, available initially in two standard ratings: 2.4 kv, 25 kvar, and 7.2 kv, 25 kvar . . . General Electric soon will launch promotional campaign on electric radiant heating of residences.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off the Washington Wire . . . During calendar 1954, REA approved $171.4 million in loans, including $40.3 million for generation and transmission. Borrowers added record 202,822 kw to their systems during year, and new loans provided for an additional 118,390 kw. Borrowers' sales jumped 2.8 billion kwhr over 1953.

SEC has wound up hearings on MVGC's proposed initial financing plans. Decision is expected in next 10-14 days. In final brief, MVGC urged rejection of arguments by the Volpe group . . . N. Y. State Power Authority awards $5,051,461 contract to Allis-Chalmers Manufacturing, and $5,086,190 contract to Baldwin-Lima-Hamilton, each for eight turbines for St. Lawrence power project. Difference between these figures and those shown in Jan. 17 issue of EW (p 10) is due to escalator clause and other items, says Power Authority.

AEC has approved nuclear power study by Consumers Public Power District, Columbus, Neb. . . . Newly-incorporated American Nuclear Society will hold its first annual meeting June 27-29 at Pennsylvania State University . . . Washington Water Power & Stevens County (Wash.,) PUD have broken off negotiations for sale of PUD's properties to company.

Consolidated Edison Co of N. Y. and UWUA-CIO sign 2-year no-strike, no-lock out contract providing 5¢ an hour wage increase . . . Columbia Interstate Compact has been signed by federal representatives and seven member states and now goes to Congress and state legislatures for consent enactment . . . First Boston Corp group offers 400,000 common shares of Toledo Edison at $14.25 a share ($5.7 million) to yield 4.91% (see Financing Table p 281) . . . Rochester G&E plans $10 million bond sale.

New York state Senator Earl W. Brydges and Assemblyman Ernest Curton introduce resolution urging Legislature to call on Congress to approve legislation permitting five private utilities to redevelop Niagara Falls power. Action signals split in Republican ranks. It is repudiation of party's 1954 platform and is break from former Gov Dewey's stand. Brydges and Curton express belief great majority of public opinion in state favors their stand. Only with private development can people of New York City benefit in Niagara project, they say.

ABOUT PEOPLE IN THE INDUSTRY

On Niagara issue, Alexander M. Beebee, president, Rochester G&E, has this to say: "If subsidization of power is to be justified in a fully-developed area like New York State, then every other state has the same right, and the trend toward socialism in our industry just cannot be stopped. The time has come in this country when we must have equality of taxation, not special privilege for certain groups. The Niagara issue is not just New York state matter—it is a national one."

Attacks on Dixon-Yates project have come entirely from those who favor "further nationalization of electric power industry," says Chas. E. Oakes, president, Pennsylvania P&L in a report to stockholders. "Contract forces a decision: is U. S. to go further toward socialism . . . or away from it?" If government can take over production of power in one place, do people expect it to take over power everywhere? "And after electricity, what next?"

More News About People page 260

Retiring Governor BYRNES—"I recommend that an appropriate committee investigate the Authority to determine whether . . . it will be able to meet its financial obligations . . ."

Santee-Cooper Finances Face a Close Scrutiny

A full-scale investigation into the financial stability of the South Carolina Public Service (Santee-Cooper) Authority may be in the offing as a result of disclosures and recommendations made by Gov James F. Byrnes in his farewell address Jan. 12 to the South Carolina General Assembly.

The governor, who left office Jan. 18, spoke bluntly of his concern over the state of Santee-Cooper finances, suggesting the possibility that the authority might not be able to meet its current obligations and those falling due in the period immediately ahead. He related that a member of the Santee-Cooper board had told him the authority would have a deficit of $750,000 this year. He also raised the eventuality of the authority's going into the receivership, and urged the legislature to look thoroughly into the authority's financial affairs.

Byrnes listed the cause of the deficit as contracts which the authority has to sell some power to some customers for much less than Santee-Cooper is able to produce power and much less than Santee-Cooper is able to purchase power from Clark Hill project.

"If this explanation is correct," Byrnes said, "it is obvious that the more power the authority sells the more money it loses."

The retiring governor said the authority is faced with either raising its rates or asking the legislature for additional operating funds.

The day following his address, two separate resolutions were introduced in the South Carolina House of Representatives. Both were aimed at carrying out the governor's recommendations, and both posed these questions for the investigating committee, if one can be created:

1. Will Santee-Cooper be able to meet its financial obligations this year and in the next four fiscal years?

2. If Santee-Cooper is unable to meet its obligations, what reasons lie back of that inability?

3. Will Santee-Cooper be able to make its usual annual payment of approximately $200,000 to the State of South Carolina?

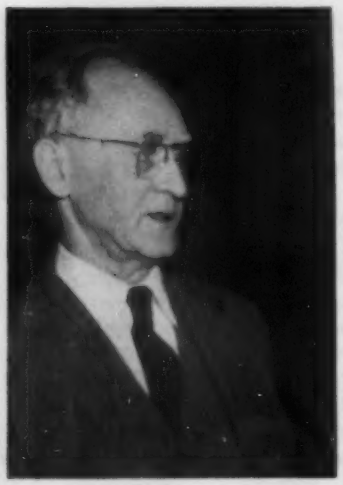
4. Is any remedial legislation needed to improve Santee-Cooper's management and financial stability?

Each resolution cited the state's interest in Santee-Cooper as an agency of state government and raised the possibility of adverse effects upon the state's financial structure if the authority were not able to meet its obligations. They would have the investigation conducted by a five-member committee of the House of Representatives. The committee would be allowed $3,000 for necessary expenses and would be required to report back to the House within 60 days.

Legislative inquiries into Santee-Cooper affairs generally have been conducted by the House, since the authority itself has considerable power in the Senate and presumably could block or neutralize any effort at a joint investigation. The general manager of Santee-Cooper is State Sen R. M. Jeffries, who represents Colleton County in the Senate. Aligned with him in protecting public power interests is Sen Edgar A. Brown, of Barnwell, chairman of powerful Finance Committee.

In the current instance, Jeffries has declared that Santee-Cooper has "nothing to hide" and that he would welcome "a fair and impartial investigation." In a statement to the press immediately following the governor's address, Jeffries had this to say:

"It is my belief that Santee-Cooper



Santee-Cooper Manager JEFFRIES—"I . . . would welcome a fair and impartial investigation in order that all doubts may be removed . . ."

will work out its financial affairs successfully and quickly, making adjustments where necessary, and that the authority will continue to assist in the agricultural, industrial and domestic development of the people of South Carolina . . .

"Santee-Cooper has nothing whatsoever to hide and for that reason I, as manager, would welcome a fair and impartial investigation in order that all doubts may be removed and all misrepresentations which have occurred in the last few months completely answered."

Reported Difficulties

Many reports have circulated during the past year that Santee-Cooper was in straitened financial circumstances, and was hard put to meet its obligations to the federal government, and to holders of bonds from which funds were secured for construction of the new steam plant adjoining the hydro-electric station. One element of those reports has dealt with the authority's 35-year contract with the Central Electric Power Cooperative, a "super-co-op" in which are banded together some 16 individual REA co-ops scattered throughout central and lower South Carolina.

Under terms of the long-range contract, Santee-Cooper is to provide Central Electric with current at a rate of 6 mills per kilowatt hour. During that period, Santee-Cooper is obligated to pay off the multi-million-dollar REA loan with which Central Electric constructed a vast network of transmission and distribution lines in South Carolina. At the end of the 35-year period, title to that network of power lines is to pass to Santee-Cooper.

Rate Adjustment Talks

One of the issues now disturbing the arrangement is the possibility of Santee-Cooper's seeking an increase in its rates with Central Electric. In response to a direct question, Jeffries acknowledged that Central Electric was one of the customers with which authority officials has been discussing rate adjustments. Thus far, no announcement of any change in that or other rates has been made.

Meanwhile, the manager of Central Electric Power Cooperative, E. V. Lewis, says the cooperative hopes to retain its present rate schedule with Santee-Cooper.

SPA Seeks Rate Increase

Southwestern Power Administration finds boost necessary to offset reduction in firm energy caused by long drought

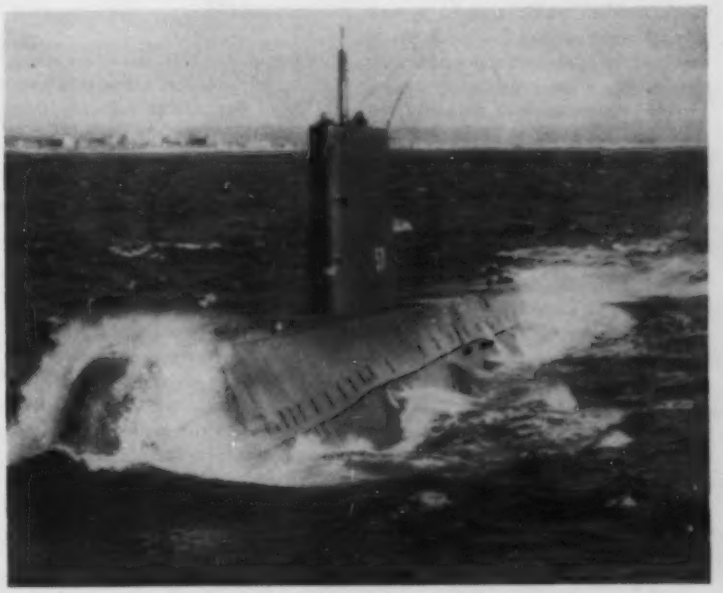
Southwestern Power Administration has filed with Federal Power Commission a revised five-year rate schedule to boost its power revenues to offset an approximate 23% reduction in firm energy caused by this year's long and severe drought.

Because of the complexity of the proposed changes and the time anticipated to study them, the agency has asked FPC to extend its existing schedules for 90 days.

SPA explained that non-firm energy in its area is of little value, and that the approximate 23% reduction in firm energy requires "a rather drastic increase in the price of firm energy if investment in transmission facilities and project investments allocated to power are to be amortized in a reasonable period of time." Because of the "drastic nature" of the increase, SPA proposes to make the change in two increments, permitting discounts under two new schedules until power from Table Rock starts coming in during 1960.

Present rates (Schedule A) average 5.5 mills per kwhr at 50% load factor, based on $1.35 for the first 200 kwhr, plus 4 mills per kwhr for all over this amount. The new rate structure would be:

• **Schedule A Revised**—Government would supply 150 hours of use per month per kw out of hydro, and the remainder of a customer's requirements would be supplied from other sources through interchange agreements. There would be a demand charge of 65¢ a month, plus energy



'Under Way on Nuclear Power'

The Nautilus, the U. S. Navy's new PWR-powered submarine, is shown kicking up spray over her bow as she picked up speed during trial runs last week on the surface of Long Island Sound off New London, Conn. Twenty-nine minutes after the Nautilus' bow, stern, and two springer lines had been cast loose, this blinker message was given to nearby craft: "At 1601Z under way on nuclear power."

charge of 4.5 mills per kwhr for the first 150 kwhr of use per month per kw. A second block of energy would be charged for at the rate of 6 mills for all over this 150 kwhr. At 50% load factor, this would average 7.16 mills per kwhr. There would be a 10% discount until Table Rock comes in, bringing interim rates to an average of 6.44 mills for cooperatives and other distributors.

SPA estimates 380 million kwhr would be sold this way, producing an increase in annual revenues of $357,000 until Table Rock starts producing, and $631,000 thereafter.

• **Rate Schedule "PS"**—This peaking service rate is based on a demand charge of 65¢ per kw, plus 3 mills per kwhr up to a limit of 1,800 hours a year. This rate would be 1.5 mills per kwhr less than the energy charge for the first 150 kwhr/month/kw in Schedule A Revised (above) as an inducement to take delivery at the government's system.

The upward limit of 1,800 hours a year came about as a result of an FPC-Army-Engineers-Interior Department-Reclamation Bureau-SPA study in September which showed a new critical water period last year. As a result of this study, estimates of annual firm energy from projects on the integrated system must be reduced from 1,015 million kwhr to about 780 million kwhr, representing approximately 1,800 kwhr/yr/kw of dependable capacity. The government has contracts with Oklahoma Gas & Electric Co and Public Service Co of Oklahoma, and with Arkansas Power & Light Co and Reynolds Metals Co requiring delivery of 2,400 kwh/yr/kw of capacity. These delivery commitments would be curtailed during critical water periods.

SPA estimates 130,000 kw and 234,000,000 kwhr/yr would be sold under this schedule until Table Rock comes in, then 292,000 kw/yr and 526 million kwhr/yr, producing revenues of $1,481,000 and $3,855,000. Rates counting Table Rock energy would average 7.33 mills. A 15% discount until then would bring the average rate down to 6.23 mills.

• **Rate Schedule "SE"**—This new category, supplemental energy, covers energy sold between 1,800 and 2,400 hours a year, at 3 mills per kwhr. Past water records indicate that in nine out of ten years, secondary energy can be scheduled at about 600 kwh/yr/kw of dependable capacity. Price is the same as the energy portion of schedule "PS" (above).

• **Rate Schedule "EE"**—This covers that portion of secondary energy after deduction of supplemental energy. Since delivery of hydro secondary energy is not assured, the low rate of 1.5 mills per kwhr would be charged, which is something less than fuel cost. The existing rate is 1.25 mills, but fuel cost increases have forced a slight rise in this rate.

An average of 149 million kwhr/yr of secondary energy should be available for sale, producing $223,500 a year in revenue, the agency estimates.

• **Rate Schedule "EC"**—Capacity is available from time to time in excess of capacity required to meet contractual commitments. SPA believes it can market this hydro excess capacity when available—about 4 months a year—at 50¢ kw/month. In an average water year, prior to production at Table Rock, it estimates there will be 47,000 kw of excess capacity available for sale, producing $94,000 a year.

In addition to the foregoing rate changes, the agency also proposes:

• To market power from Denison, Bull Shoals, Fort Gibson, Tenkiller Ferry and Table Rock as an integrated system, and to market power from Whitney, Blakely Mountain, Norfork and Narrows as isolated installations. Whitney, Blakely Mountain, Norfork come in about July 1955.

• Arkansas Power & Light Co to make available to the integrated system capacity equal to installed capacity at Blakely Mountain and energy equal to all primary energy plus one-half of secondary energy in exchange for Blakely Mountain output.

GE Gas Turbines Used in Foreign Plant

The battery of ten 6,000 hp General Electric Co gas turbines shown above is reported to be the largest concentration of such turbines in the world. The units power the compressors at Creole Petroleum Corp's new Lake Maracaibo, Venezuela, gas conservation plant. The facility, said to be one of the largest plants of its type in existence, marks the first major step toward economic utilization of gas produced in the Bolivar Coastal Field of Venezuela. The turbines use as fuel a part of the gas that is collected each day.

Georgia Power Plans Dam

Georgia Power Co has announced plans for construction of a 48,000-kw hydroelectric project on the Chattahoochee River at Columbus. Cost of the dam and plant are estimated at more than $11 million. Plans call for a dam that will attain a maximum height of 75 ft and width of 1,848 ft.

Ike Continues 'No New Starts' Policy

A whale of a battle shaped up in Washington last week when President Eisenhower submitted a fiscal 1956 budget which reduced federal power expenditures one-third. Biggest jolt was a cut of 77% in new money for the TVA.

Democrats, armed with advance information as to his intentions, cried out and counterattacked. Their first step, before the message had even been submitted to Congress, was to pack the House Appropriations Committee with tried and tested public power members (see story p. 116).

Analyzing the federal budget is no easy matter, but one did not have to look deeply into the statistics of the 1,200-page document to see that Eisenhower was standing solidly behind his "no new starts" policy for Tennessee Valley Authority and other federal power generation agencies (see chart).

The emphasis throughout the new budget is on transmission construction, rather than generating capacity. The plan for federal expenditures during the fiscal year starting July 1 calls for $270 million to be spent on steam plants and multipurpose projects, compared with $490 million last year, and $81 million for transmission facilities, compared with $94.7 million last year.

Generating capacity installed by federal agencies now amounts to 14.07 million kw, or about 14% of the total capacity of Class 1 utility systems in the U. S., Eisenhower said. An additional 5 Mw of capacity is scheduled for completion during the calendar 1955 and 1956, bringing federal capacity to 19.07 Mw. When all present construction jobs are completed, federal capacity will total 21.51 Mw. Of this eventual total, the Army Corps of Engineers has scheduled 6.73 Mw; Reclamation Bureau, 5.26 Mw; TVA, 9.46 Mw; and the International Boundary and Water Commission, .06.

Eisenhower did not abandon the idea of federal development of power sites, but his requests for funds to implement several such programs is consistent with his philosophy that the government should take on the job of power generation only where private industry cannot afford to do it. He specifically called on Congress to appropriate $5 million for the Bureau of Reclamation to begin work on the Upper Colorado River Basin Project, and $2 million for the Fryingpan-Arkansas Project in Colorado. At the same time, he notified Congress he would ask later for $20 million to finance the Army Corps of Engineers and Reclamation Bureau in "partnership" development of the Cougar Dam, Green Peter-White Bridge, and Rocky Reach Dam projects, and several projects not yet announced. He said provision will be made for future partnership projects, including Priest Rapids and Markham Ferry, when "satisfactory arrangements" are completed.

Power Construction Expenditures proposed by Eisenhower

Agency	Fiscal 1955 (millions of	Fiscal 1956 dollars)
Army Corps of Engineers		
Multipurpose projects	218.2	193.2
Partnership projects (to be requested later)	.....	10.0
Interior Department		
Reclamation Bureau		
Multipurpose projects	34.2	30.6
Transmission	15.8	17.6
Partnership projects (later)	.....	10.0
Bonneville Power Administration		
Transmission	36.1	32.0
Southeastern Power Administration		
Transmission	.....	.....
Southwestern Power Administration		
Transmission	1.6	.4
Tennessee Valley Authority		
Multipurpose projects	8.5	1.7
Steam-electric plants	226.5	43.9
Transmission	41.2	31.4
International Boundary and Water Commission		
Multipurpose projects	2.9	1.3
Totals	585.0	372.1

TVA

Last year, both TVA and the Administration warned of an impending shortage of power in the Tennessee area unless provision was made for new starts. Eisenhower's 1955 budget made no provision for new federal generating capacity there, and instead called for the cooperation of private utilities in lessening TVA's load by about 600,000 kw. The now-famous Dixon-Yates contract resulted.

The prediction had been that a new generating plant would be necessary by 1957 if the power shortage was to be averted. Supporters of the Dixon-Yates proposal said that, unless construction began by the end of calendar 1954, there was a distinct danger that spring floods on the Mississippi River would bog down the project and delay initial generation by a year. The feared delay came to pass, and apparently the new Dixon-Yates plant will not be able to start pumping the anticipated 600,000 kw into TVA lines until 1958. But the President's Budget Message indicated the Administration is no longer worried about encountering a shortage in 1957. On this subject, Eisenhower said: "No appropriations have been recommended for new power generation units in the fiscal years 1955 and 1956 for the TVA. After 600,000 kw contracted for by the Atomic Energy Commission with the Mississippi Valley Generating Co become available for replacing power furnished the AEC by TVA, the scheduled capacity of the TVA system will provide for a substantial increase in loads through the calendar year 1958."

TVA in 1956 will get only $27,550,000 in new money, compared with the $120 million it got this year, and the $188.5 million appropriated in fiscal 1954. The Eisenhower program put a stop order on funds for new ca-

pacity, and requested legislation to require TVA to pay an "adequate" rate of interest on Treasury money. The President said the question of further TVA expansion of capacity should hang fire while Congress determines how the agency should be financed, and he directed completion this session of a study being made by TVA General Manager Aubrey Wagner of other financing possibilities, including issuance of revenue bonds.

Total funds available to TVA for the new fiscal year are estimated at $316,237,000.

Of the new money asked for TVA, Eisenhower wants $525,000 to go into hydro generating units at two plants, $11 million for seven steam plant projects, and just under $8 million for transmission system facilities. He has earmarked $6.5 million of TVA's transmission money for lines to meet those of the Dixon-Yates plant. Democrats have already said they will vote against this.

SPA, Sepa

For the second year, no money was asked for SPA's continuing fund, which was ordered abolished by Congress in 1954. SPA was allotted $1,134,000 for operating and maintenance, with no plans for new construction.

Southeastern Power Administration has $1,160,000 earmarked for its operations this year. It has no construction scheduled.

BPA

BPA's $25.4 million in new funds is chiefly for construction on going projects ($20 million). Only $6 million is scheduled for new work, and this is matched by funds for operation and maintenance.

USBR, Engineers

About $200 million of the Engineers' funds will go into continuing construction on 14 multipurpose projects with power installations. This represents a decrease of $4.4 million from fiscal 1955, and decrease of $7.5 million under 1954, but Eisenhower said the funds requested would provide for maintenance of construction schedules and power-on-the-line dates.

The Engineers have a $5-million fund earmarked for advance engineering and design. Of this, $870,000 is to go into planning of multipurpose projects at Coosa River, Ala.; Greers Ferry, Ala.; Lower Cumberland Lock and Dam, Ky. and Tenn.; Libby Reservoir, Mont.; Cougar Reservoir, Ore.; John Day Dam, Ore. and Wash.; and Hills Creek Reservoir, Ore.

The Reclamation Bureau's request for transmission funds has been raised about $2 million, but its multipurpose money has been cut by $4 million. Eisenhower recommended an increased Bureau budget for general investigations, and asked $1 million for a survey to determine whether hydro power can be developed from Passamaquoddy Bay, Me., tides.

REA, FPC

The Administration asked loan authority of $160 million for the farm power program, with provision for REA to borrow another $35 million from the Treasury. The budget estimated there would be $230 million available for loans.

FPC was alloted $4,650,000 for salaries and expenses, an increase of $400,000 over its fiscal 1955 appropriations. It is estimated that $764,000 of this will go for licensing of nonfederal hydro projects and that $1 million will be spent on regulation and surveys of the industry.

AEC

AEC's operating expenses for 1956 are estimated at $1,120,900,000, an increase of $11 million over 1955. Significant hike in allocations is a jump from $95 million to $118 million for reactor development.

AEC had left over from prior obligational authority about $220 million which will be transferred to operating expenses. No new money will be asked for plant and equipment, but unobligated sums will cover anticipated $214 million for plant improvements and reactor development. Budget proposes spending $39.9 million for developmental power reactors.

New Unit Handles Power Funds

The Democratic leadership of the House of Representatives has taken the first step toward killing the Dixon-Yates contract for a power plant at West Memphis, Ark., by the process of depriving the Administration of the money to carry out its end of the bargain.

With full backing from House Speaker Sam Rayburn, the House Appropriations Committee is being reorganized to do the trick. Committee Chairman Clarence Cannon of Missouri has established a new subcommittee to take over the money bills of the Atomic Energy Commission and the Tennessee Valley Authority. The nine Democratic members assigned to it are "pro public power." Six Republicans are to be designated by Rep John W. Taber of New York, senior Republican of the full committee.

To Handle Power Agencies . . . The new subcommittee, called the Subcommittee on Public Works, will handle: AEC, TVA, Interior's Reclamation Bureau, Southwestern Power Administration, Southeastern Power Administration, Bonneville Power Administration, and the civil functions of the Army Corps of Engineers.

The nine Democrats named, headed by Cannon, are committed to federal power. Besides Cannon, veterans Louis Rabaut of Michigan, and Michael Kirwin of Ohio, both New Dealers, are ranking members, followed by John Fogerty of Rhode Island, Joe Evins of Tennessee, Edward Boland of Massachusetts, Fred Marshall of Minnesota, Tom Murray of Tennessee, and John Riley of South Carolina.

Kirwin will remain in control of the Interior subcommittee which will handle Federal Power Commission's money. FPC and other power agencies had formerly come under jurisdiction of an independent offices subcommittee headed by Albert Thomas, a conservative Democrat from Texas.

Cannon's quick action in establishing the new subcommittee points to major fight over Dixon-Yates being fought on funds to AEC and to the TVA.

In the Senate, Chairman Clinton Anderson of the Joint Congressional Atomic Energy Committee, is out flatly on a program to kill Dixon-Yates, too. He will seek to get the atomic committee to reconsider its vote last fall waiving waiting period to permit AEC to sign Dixon-Yates contract.

WASHINGTON CHECKLIST

Dixon-Yates—Reply briefs from all sides filed with SEC Jan. 18. Oral arguments began Jan. 19. Decision could come anytime after arguments end.

Atomic Energy — Congressional Joint Atomic Energy Committee meets to fix schedule of hearings on industrial use of atomic energy. AEC has to report to committee by Jan. 31.

Bills Introduced

Tuolumne Project: To authorize the project (HR 2388, Engle, D-Calif.)

Bridge Canyon: To authorize dam on Colorado River (S 405, Malone, R-Nev; Anderson, D-N. M.; Kuchel, R-Calif.; Goldwater, R-Ariz.; Dworshak, R-Idaho; Barrett, R-Wyo.; Jackson, D-Wash.; and Bible, R-Nev.)

REA: To repeal state allotment formula (S 153, Thye, R-Minn.; Aiken, R-Vt.; Young, R-N. D.)

TVA: To abrogate resale rate controls (HR 417, Dondero, R-Mich.)

Valley Authorities: Bill to ban them without affirmative vote of people affected (HR 341, McDonough, R-Calif.)

Trinity River: To provide for federal construction of project (HR 105, Engle, D-Calif.)

Frying-Pan-Arkansas: To provide for federal construction of project (HR 412 Chenoweth, R-Col.)

Upper Colorado: To provide for federal construction of project (HR 270 Dawson, R-Colo.)

Libby Dam: To rescind federal authorization to construct (HR 419, Dondero, R-Mich.)

Tri-Dam Project: To provide federal aid for California project (HR 533, Johnson, R-Calif.)

Missouri Basin Compact: (HR 109, Hope, R-Kan.)

BPA Office in Portland

Bonneville Power Administration has established a Portland, Ore., area office in the Interior Department Bldg. The Portland office, transferred from Eugene, will be responsible for supervision of all operations, maintenance, and customer services in southwest Washington and western Oregon. BPA will maintain a district office at Eugene.

Ray P. Moore . . .

. . . Wins Kwhr Pool

Niagara Mohawk engineer is 0.02% off 1954 output

Ray P. Moore, mechanical engineer, Niagara Mohawk Power Corp, has won the 1954 Kwhr Power Generation Pool with an estimate of 472,108 million kwhr, only 0.02% off the Federal Power Commission's figure of 472,215,089,000 kwhr. There were 373 entries.

The contest, now in its tenth year, is conducted by Robert M. Hatfield, Jr, vice president of Combustion Engineering, Inc.

A close second behind Moore was Paul Gravelle, mechanical engineer of Toledo Edison Co, who was within 0.025% of the winning figure.

Ladies Maintain Showing . . . The ladies kept up the good showing of past years with Mrs Luna Brown of Dallas Power & Light Co tying for third with Arnold Milliken, vice president, New York State Electric & Gas Corp.

These two were followed by Don Hogg, Cleveland Electric Illuminating Co, fifth; John Bruce, Southern California Edison Co, sixth; John Jamison, Central Illinois Electric & Gas Co, seventh; and E. C. Woods, Public Service Co of Indiana, eighth.

In the utility presidents group of 41, Ernest R. Acker, president of Central Hudson Gas & Electric Corp, and Clay C. Boswell, president of Minnesota Power & Light, were barely out of the running with guesses 0.1% off.

Entries in the 1955 pool are being accepted now and must be in by the end of February.

Nuclear Congress

Atomic meeting and exposition is scheduled to be held in Cleveland Dec. 12-17

Under the leadership of Engineers Joint Council, a dozen organizations, representing more than 250,000 American scientists, engineers, and industrialists recently announced that they would hold a Nuclear Congress and Atomic Exposition in Cleveland, Ohio, Dec. 12-17. Basic objective of the congress is to launch a continuing program of interchange of information on the peace time applications of nuclear science.

Participation in the congress will be open to all major technical groups interested in nuclear engineering. Among the many subjects to be discussed will be site selection, instrumentation, and design of nuclear power plants, removal of radioactive wastes, reactor metallurgy, and water pollution.

Full Program Is Planned . . . Dr D. L. Katz, chairman of the Chemical and Metallurgical Engineering Departments at the University of Michigan, is chairman of the program committee. He said the program would include addresses and papers on nearly 100 technical and management subjects. A few outstanding papers by foreign authors will be presented. Many of the papers will discuss important atomic developments for the first time.

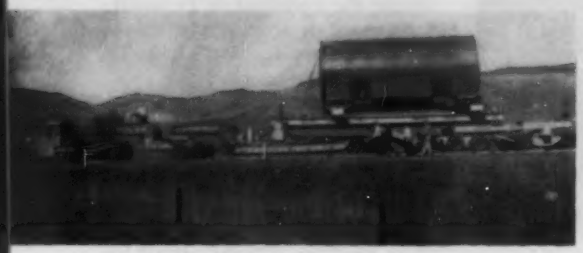
The exposition part of the congress will bring together under one roof for the first time all the major developments in the nuclear energy field. Suppliers to the various nuclear industries are also being invited to display their products.

Timing of the meeting has been carefully selected to come as soon as possible after the close of the UN "Atoms-for-Peace" meeting in Geneva, Switzerland.

Cloud Seeding Program

Utah Power & Light Co is engaged in a "limited seeding" of clouds over the Bear River drainage area in southern Utah and southwest Wyoming where the utility derives most of its hydro.

156,250-Kva Unit on Tractor-Trailer,



Weighing 276 Tons, Travels Overland

to Morro Bay Site in 8 Days

ADDITIONAL TRACTOR serves as anchor for unit pulling generator onto trailer which is shown at left making the trip

Generator Moves 9 Miles on Deck of Planks

A protective deck of planks was laid, picked up, and relaid as a 217.5-ton generator and its special trailer inched its way recently over a nine-mile stretch from a rail siding to the Pacific Gas & Electric Co's Morro Bay Plant. The 156,250-kva unit is scheduled to go into operation there in the spring.

A crew of 59 men worked around the clock for eight days laying the quarter mile of planks before the tractor-trailer, removing them and placing them again as the unit moved at a speed of about one mile a day. Some 550 20-ft, 3-by-12-in. planks were used.

Route and Procedures . . . PG&E and General Electric Co engineers took two years to determine the best route and procedures for shipping this huge generator on an 82-wheel tractor-trailer, a combination weighing 276 tons. The combination's 89 by 17.5-ft dimensions were needed to spread the weight to protect the roadway.

The rail siding at Camp San Luis Obispo was selected as the nearest terminal permitting travel to Morro Bay over the fewest highway bridges.

Although the last nine miles of the cross-country trip were the toughest, engineers spent months figuring how to squeeze the mammoth generator, largest ever shipped West, through the long, narrow railroad tunnels between Los Angeles and the rail siding.

Negotiating Tunnels . . . The first obstacle north of Los Angeles was the 745-ft Timberline Tunnel at Santa Barbara. Closer to Morro Bay was an 866-ft tunnel.

To negotiate these, the generator was shipped without the eight coolers which extend about 12 in. out from either side of the stator. Even with this provision, tunnel clearances were less than a half inch in some places, and the rail trip took 18 days. The coolers will be installed at the plant site.

Alternate Routes . . . Several alternative routes were considered with the objective of bypassing the tunnels, including shipment by water through the Panama Canal and up the coast to Morro Bay. These, however, presented their own peculiar obstacles and were discarded when the route from Camp San Luis Obispo appeared practicable.

With experience with this route now behind them, engineers are planning to move a second unit for Morro Bay over the nine-mile interval in the same way later this year.

A-FRAME DERRICK truck speed transfer of planks around trailer so crews can re-lay wooden carpet

SPECIAL TIMBER BRIDGES protect highway culverts and bridges in the path of the 276-ton load consisting of the 156,250-kva generator and the 82-wheel tractor-trailer

OVERHEAD LINES are raised by crewman using a telescoping pole, the upper section of which is raised and lowered by block and tackle

MORRO BAY PLANT of Pacific Gas & Electric Co is the end of the trip for the stator. A second unit will be transported in the same way

Chicago Utility Proves 'Disaster' Plan

Prearranged operating procedure speeds restoration of service when turbine explodes at Ridgeland Station of Commonwealth Edison. Top executives are called to the scene. Reporters and photographers are given full cooperation

It was just before midnight on Sunday, Dec. 19. At the Ridgeland Station of Commonwealth Edison Co at Stickney, Ill., a 160,000-kw unit was being brought into service. The unit was a new one. It first went into service the preceding August. The other three units of the same rating were also new. Then something "let go".

A few minutes later the unit was a wreck. And Ridgeland's 640,000 kw had been taken off the line.

What followed immediately and in the next two days was as well planned as the explosion had been unplanned. The company's operating procedures include instructions on what is to be done in case of such a disaster. Here was the time to test them under the severest conditions imaginable.

Interconnections Called On

Within minutes other companies with which there were interconnections were called upon to supply the 200,000 kw of capacity that could be made available. Operating Vice Pres R. D. Maxson had been called, and within 30 minutes he was at Ridgeland directing the clean-up operations.

Almost as quickly practically all of the other executives of the company had been called from their homes and were either at Ridgeland or at the dispatcher's office where they could follow the developments and direct the activities.

This was possible only because of the prepared "disaster plan." All operating personnel were under orders to call department heads, executives, and officers at any time, day or night, in cases where trouble could not be cleared immediately and where it appeared conditions warranted it. A chart had been set up as a guide to those on the job in making those calls.

Executives Take Key Posts

Willis Gale, chairman; H. P. Sedwick, executive vice president; and J. Harris Ward, commercial vice president, went immediately to the dispatcher's office in the company's headquarters office building. John W. Evers, president, and Vice Presidents Murray Joslin, finance; Morgan Murphy, public relations; and Thomas G. Ayers, industrial relations, joined Vice President R. D. Maxson at Ridgeland station. All of the Ridgeland station personnel not away on vacation or sick leave were on the job in the early morning hours. This included telephone operator, Miss Edith J. Cleary, and nurse, Mrs. Frances McLachlan.

Assisting Maxson at Ridgeland were Vern L. Stone, manager of power production, and John F. Sullivan, Jr, manager of construction. Emergency calls went out immediately for members of their staffs and for added working forces. Contractors were called to furnish welders and repair crews. The turbine manufacturer's representative called out its men immediately. In a matter of hours dozens of men arrived to start the work of cleaning up and putting the station back in operation.

Vice President Ayers; C. E. Parker, assistant vice president; and Volney B. Leister, personnel director, assembled industrial relations forces. They provided coffee and sandwiches for everyone on the job during the early morning hours, until regular food services were available.

Ayers also had representatives call personally on the families of the two men who were killed before the names of the men were given to the press and radio. The company photographer went into personnel records and made prints of pictures of the men for the newspapers in time to make the morning papers. This made it unnecessary for newspapers to contact the families for them.

Public Relations Aids Press

Public relations angles were also well-handled from the beginning. Vice President Morgan Murphy and Director of Publicity William Bromage, responding to the midnight call, were on the job at Ridgeland soon after the explosion. Normal restrictions on admissions to the plant were lifted. Orders were given to admit all newspaper reporters and photographers, and they were given stories and pictures. Police, firemen, and the coroner and his staff were assisted in the performance of their duties.

Meanwhile the executive group in the dispatcher's office was busy making plans to meet the problems that would face them as soon as the day's load began coming on the system. It was expected that the annual system peak load would be reached within two or three days.

With 640,000 kw of generating capacity out of commission and with only 200,000 kw available over ties with neighboring systems, it was apparent that emergency measures would be necessary and that substantial curtailment in power use would be required. It was decided that 100 of the largest customers would be contacted before the day's industrial loads came on and that they would be asked to reduce their use of electricity to not more than 75% of normal.

Customer Curtailment Sought

Commercial Vice President Ward; his assistant, Ralph G. Raymond; and Le Grand Cannon, manager of power service, set the machinery in motion to enlist the help of large power customers. Twenty power service representatives spent the early morning hours calling large industrial users and soliciting their cooperation in the emergency. These men worked from their regular offices in the differ-

ent division headquarters of Commonwealth Edison. By 6:20 AM 104 customers had been notified. This activity increased as the day progressed until 110 power service representatives were busy making phone calls to their industrial customers. By 3 PM 642 customers had been requested by phone to reduce power use to no more than 75% of normal.

As the first day of the emergency progressed, it became apparent that the evening peak would present another serious problem. By noon Monday an appeal was issued through radio and newspapers to commercial and residential customers to curtail power use from 4 to 8 PM. They were asked to eliminate Christmas lighting, window lighting, sign lighting, and all similar uses.

It was not possible to tell immediately how long the emergency would last. At first it looked as if it would take all of Christmas week to get enough of the generators back in service to eliminate the need for curtailment. By working repair crews 'round the clock, some of the units were coming back on the line late Tuesday. The decision was reached late Tuesday afternoon that if the machines that were being put back in service could take full load, or near full load, it would be possible to announce removal of restrictions by 8:30 that night.

Radio and TV Informed

Newspaper and radio releases and radio and television spot commercial announcements were prepared, and arrangements were made to release them at 8:30 PM if all went well. Progress on restoring three of the Ridgeland units was such that the curtailment was ended at that time.

Commercial Vice President Ward's department kept the large industrial customers informed through both days of the emergency. They were told the progress that was being made with the repair work so that they could plan their operations accordingly. The 110 power service representatives were kept busy calling the 642 large customers several times a day until the final call Tuesday night telling them that the emergency was over.

The public relations department was on the job constantly. There was no withholding of information. The public was informed as to what happened, why the curtailment of service was necessary, and were notified as soon as possible when the emergency was over.

Demand Charges Waived

When service was restored to normal, Commonwealth Edison obtained Illinois Commerce Commission approval and waived demand charges during the two days of curtailment for the industrial customers telephoned. This constituted an adjustment in their bills in return for and in appreciation of their cooperation. A letter was addressed to these customers by Chairman Gale notifying them of the waiving of the demand charges and expressing the company's appreciation for their cooperation.

The coroner's jury which was picked to investigate the two fatalities, visited Ridgeland Station to get first-hand information. Vice President Murphy (Public Relations) arranged transportation from the County Morgue, to and from Ridgeland for the jury, the coroner and his aids, and the newspaper reporters and photographers covering the inquest. Murphy also arranged luncheon for them.

In the Industry's Best Tradition

(Editorial)

The quickness with which Commonwealth Edison Co restored service following the disaster at Ridgeland Station was in keeping with the industry's oldest tradition. But particularly commendable were these three factors:

1. The company management with great foresight had incorporated in its operating procedures a plan to cope with such disasters.

2. Despite the inconvenient hour top management reached the scene of the accident or the operating headquarters practically within minutes. They were available to direct restoration.

3. The press was aided in covering the story.

It was this last factor that was most unusual. It is only human nature to try to conceal unfavorable or unpleasant news. When human nature prevails, the result can be garbled newspaper stories marked by misleading statements. By welcoming the press and photographers, Commonwealth Edison got the facts to the public. Undoubtedly much of the cooperation which the company received from its customers was due to the fact that they had been fully informed. And if Chicago newspapermen run true to type, Commonwealth Edison will enjoy a "good press" for a long time. Newspapermen have long memories. They never forget.

During the period of the investigation Commonwealth Edison's officials cooperated fully in supplying information, including photographs, to the coroner and the jury.

Since damage amounted to several million dollars, it was necessary that stockholders be informed of the explosion's effect on them. They were advised, in a statement by Chairman Gale, that a large part of the damage was covered by the manufacturer's warranty and the company's insurance.

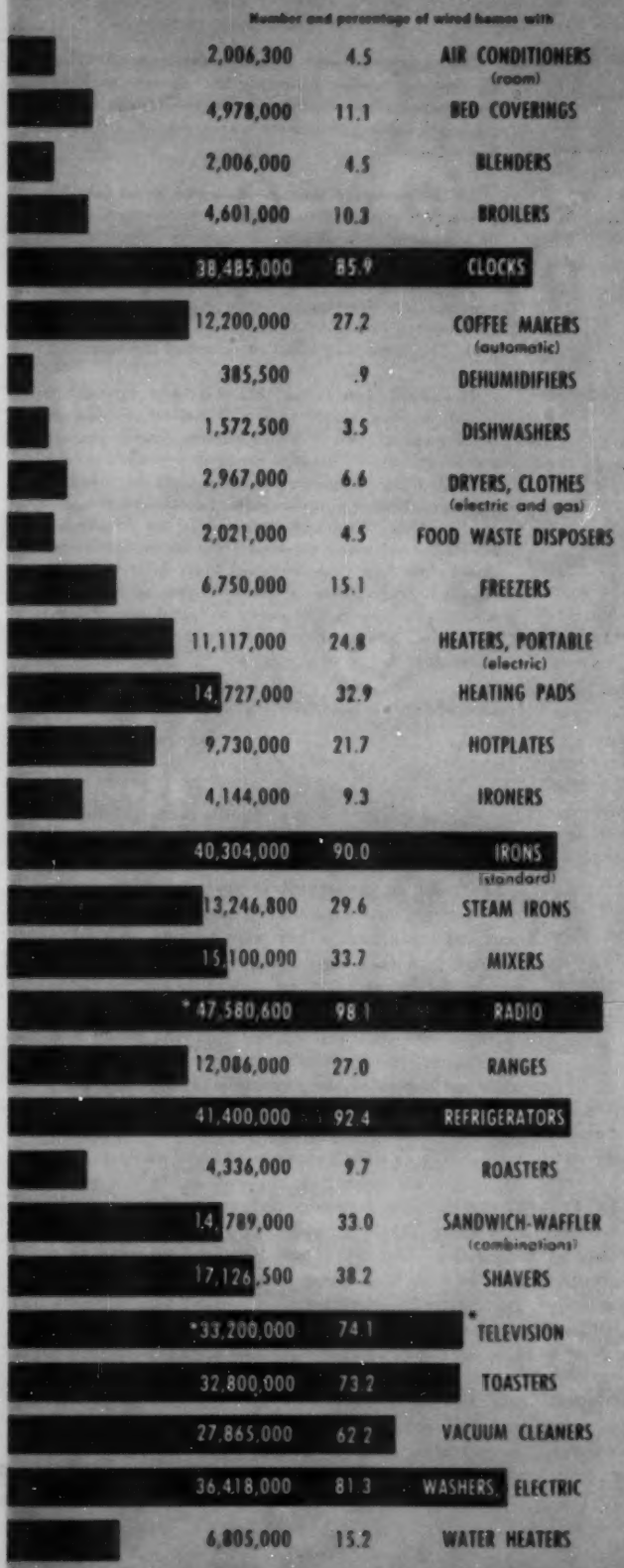
All of the company's 3,400 men and women in the management classification were given a detailed report on what had happened, the problem it created, and the probable effect on operations and earnings. This made it possible for these key people to discuss the problems intelligently with their business and social contacts and with the employees under their supervision. In this way many of the unfounded rumors and much of the misinformation which usually spread after such an accident will be eliminated. This one benefit alone will do much to maintain the high level of confidence which the public in that area has in the company.

As restoration work progresses, the company plans to keep the public up to date through stories in the daily press.

Under the circumstances normal service was restored in a remarkably short time. Operating and public relations problems were handled smoothly, chiefly because the company had a plan, prepared in advance, for such an emergency.

The Scoreboard to Date

Electric Appliance Saturations as of Jan. 1, 1955



1954: Third

Gains by new devices such as

You can mark down 1954 as the third biggest year in the electrical appliance industry's history.

Despite several pronounced symptoms of readjustment—like the highest dealer failure rate since the war (429 in the first 11 months as compared with 285 in the same period of 1953) and a feverish dumping of air conditioners—sales totaled $6.7 billion, off only 6% from 1953's 7.1 billion. Even allowing that totals computed from retail list prices are full of water, it was still a good year.

Old Standbys Falter . . . Good though it was, the pattern of sales made some significant changes. Some of the older, bread-and-butter appliances like refrigerators, ranges, water heaters, and vacuum cleaners struggled ineffectually to maintain the 1953 rate. At the same time, some of the newer, low-saturation work savers like dryers, dishwashers, air conditioners, and disposers gained.

Air conditioners, despite all their troubles at the retail level, led the gainers with a 17.7% increase in units, a 20% jump in dollar volume, representing a record of 1,230,000 units. However, the ill effects of the 1954 inventory scare, which caused retailers all over the cold-struck eastern parts of the country to dump at whatever prices they could get, may be felt more strongly in 1955. The dumping did one thing: It got rid of the units. So at the end of the season there were probably only about 600,000 left—fewer than at the end of 1953. Big danger, is that frightened manufacturers may not turn out enough in 1955 to meet demand.

Dryers Jump . . . Probably the most underestimated performer of 1954 was the clothes dryer. With sales of 890,000 units (up 20.8%) and $207,

*Radio projected from Jan. 1, 1954 Nielsen Coverage Service estimate. Total homes projected from "Sales Management" Jan. 1, 1954 estimate. Television estimated by NBC.
All figures except radio based on 44,787,000 domestic and farm electric customers. Radio based on 48,509,600 total homes.

Best Year for Appliances

air conditioners, dryers and automatic washers limit overall decline to six percent

498,250 (up 15.4%) it far overshot earlier industry estimates of a 10.5% gain in unit sales. For the electric utility industry the only shadow was the disproportionate gain made by gas units (up 39.4% in units) as compared with electric models (up 15.3%). This indicates that as more and more new makers introduce and push gas units they will eventually catch up to electric ones. Already dryer saturation is 6.6% of the nation's 44,787,000 wired homes according to *Electrical Merchandising*, a McGraw-Hill publication, and only a 12% gain in 1955 would push sales over the million mark. Most manufacturers, however, expect a modest 5% boost.

Washers on a See-Saw . . . Dryers went ahead on their own utility value. But the gains made by automatic washers (16.9% in units, 13.8% in dollars) were largely at the expense of conventional washers, which slumped 19.1% in units and dollars.

Total washer volume for the year was 3,650,000 units and $839,783,400, a small increase over 1953. This is surprising in view of the fact that 302 dealers reported to *Electrical Merchandising*, that 67% of their washer sales were made as replacements to homes which already owned machines and that 49% of sales involved acceptance of trade-ins.

Pickup for Dishwashers . . . Dishwashers, which had a poor year in 1953 with only 180,000 sales, came alive again in 1954 with a jump to 210,000 units. This was still below the record years of 1950 and 1951, but brought new hope to those in the industry who feel sales will top a million units a year in the early 1960's. Disposers, leading dishwashers since 1949, increased their margin again in 1954 with a volume of 360,000 units, a gain of 10.8% in both units and dollars. Like the dishwasher, they could give much credit for their rise to the continued high rate of home building and their attractiveness as house selling features.

Refrigerators Slow Down . . . Up against a 92.4% saturation and replacement and trade-in ratios of 69.9% (the highest of any appliance) and 49%, respectively, refrigerators did well to hold their decline to 6.2% in units and 3% in dollars. Sales of 3,425,000 units were far under the record volumes of 1949 and 1950, but refrigerators were still one of the most important items in any retailer's inventory. A new consciousness at the manufacturing level of the need for technical improvements and more aggressive merchandising promises that 1955 will be at least as good a year as 1954. Still, merchandising will have to combat the fact that nearly 75% of all wired homes now own post-war refrigerators.

Like refrigerators, ranges held their decline to small proportions: 6.8% in units, 4.6% in dollars. Volume of 1,165,000 units was by no means the best since the war, but during 1954 the range became, quite suddenly, an exciting appliance. Two new developments, color and built-in models, promised to do a face-lifting job in 1955. By the end of 1954 several manufacturers were touting, albeit reluctantly, the availability of models in several different shades of color—testimony to the power of the women's magazines. Others were rushing into the built-in field, (which accounted for 5% of the 1954 total) and which might eventually go as high as 25% of all range sales.

Water Heaters Hold . . . Thanks to a stable distributional base and the volume of home building, water heaters did even better than refrigerators or ranges, holding their decline to a miniscule 0.6% in units, 2.1% in dollars. A volume of 775,000 units is nothing to get excited about. But some manufacturers have hopes for the future, particularly if they can persuade utilities to approve of smaller units with higher wattages. This would enable electric models to compete more favorably in recovery speed and price with gas units.

Worst performer of all among old-time major appliances was the ironing machine, down to a meager 91,300 units as the result of a 42.9% decline.

Despite its difficulties, the ironer still has a saturation of only 9.3% and the market is wide open for some sales improvement, as some dealers who utilize demonstrations, follow-ups and free trials are proving.

TV Surprises . . . Early in 1954 everybody was predicting a big drop in television sales. The reason: the imminence of color. But when color came it was small screen and expensive and a Missouri-minded public changed its attitude. They ended the year by buying more black and white sets (7,300,000) than in any year since the all-time record of 1950 (7,463,800). But unit volume (a gain of 1.2%) wasn't everything. People put their money into low end table models, shied away from expensive consoles and combinations, with the result that dollar volume was off a substantial 14%.

Radio, too, was down. All three categories, home, table and clock, declined to bring total volume down to a poor 6,415,000 units. Together, radio and TV accounted for $1.9 billion of the industry's volume of $6.7 billion, while appliances held their own at the 1953 level of $4.8 billion.

Freezers Off . . . The overall stability of appliance sales owed nothing to the performance of home freezers, off 10.6% in units and 11.7% in dollars—thanks to the after-effects of the fly-by-night food plans and a lack of dealer interest. Despite sales of 975,000 units and a saturation of 15.1%, the freezer still doesn't have the demand appeal of, say, the dryer. The 1954 decline, however, is, in the eyes of the industry, only temporary. Now that the appliance is moving into the kitchen from the basement and making as presentable an appearance as the twin-designed refrigerator and now that dealers are beginning to show an awakening in-

terest, sales in 1955 should again climb up over the million mark.

Small Appliances Show No Pattern . . . If 1954 was a rocky year for major appliances, it was even more uneven for small appliances. Electric deep fat fryers—in 1953 one of the hottest items on retail shelves—burned out a lot of their appeal and dropped 28.5% to 1,895,000 units. Broilers, on the other hand, kept zooming with 1,550,000 sales, a jump of 37.2%. Automatic coffee makers, one of the most popular of the newer items, slipped 12.7%, but sales stayed up at 3,218,000 units.

Most irons were off, even the steam models. Mixers confused the picture with a drop in standard units and a 29.3% gain in portables. Wall type models were the only kind of electric space heaters to make a gain, 13.2%, while the lowly hotplate, in a decline ever since 1950, turned around and made a 2.2% gain. Clocks, the largest selling small appliance, were off 9.5% with a unit volume of 6,900,000. Shavers continued their consistent climb with a gain of 12.8% and sales of 3,950,000 units. Toasters were off 2.2% overall, but, surprisingly, owed it all to a slump in automatic models, off 4.8%, while nonautomatics jumped 18.8%.

Outlook for 1955 . . . All the paradoxes of 1954 notwithstanding, the industry expects a better year for appliance sales in 1955. It can look for a total of perhaps $7 billion. A continued high rate of housing starts, high employment, plenty of installment buying, new and improved products and a high degree of public interest in new developments like color, built-ins and stylized kitchens will help.

'54 Appliance Sales:

The old standbys faltered, but some new ones gained

	1954 Units (thousands)	1954 Retail Value ($ thousands)	1953 Units (thousands)	1953 Retail Value ($ thousands)	% Change Units	% Change Dollars
Air Conditioners, Room	1,230	$419,298	1,045	$349,514	+17.7	+20.0
Bed Coverings	1,050	37,748	948	35,976	+10.8	+ 4.9
Blenders	296	11,825	310	12,385	- 4.5	- 4.5
Broilers	1,550	75,950	1,130	56,333	+37.2	+34.8
Cleaners, Vacuum						
Floor Type	2,650	251,088	2,778	263,122	- 4.6	- 4.6
Hand Type	132	3,973	173	5,212	-23.8	-23.8
Clocks	6,900	47,955	7,625	52,994	- 9.5	- 9.5
Coffee Makers, Automatic	3,218	66,254	3,685	73,516	-12.7	- 9.9
Dehumidifiers	95	12,825	91	12,224	+ 4.9	+ 4.9
Dishwashers	210	63,000	180	54,000	+16.7	+16.7
Dryers, Clothes	890	207,498	737	179,847	+20.8	+15.4
Electric	655	146,177	569	134,342	+15.3	+ 8.8
Gas	235	61,322	168	45,505	+39.4	+34.8
Fans (attic only)	125	16,375	135	18,563	- 7.4	-13.3
Floor Polishers	325	19,500	295	19,175	+10.2	+ 1.7
Food Waste Disposers	360	46,800	325	42,250	+10.8	+10.8
Freezers, Home	975	385,125	1,090	436,000	-10.6	-11.7
Fryers, Deep Fat	1,895	41,500	2,650	79,500	-28.5	-47.8
Heaters, Convector & Radiant	1,330	34,233	1,400	33,905	- 5.0	+ 1.0
Fan-Forced & Fan-Htrs.	850	16,788	940	17,390	- 9.6	- 3.5
Non-Fan Forced	180	2,475	195	1,940	- 7.7	+27.6
Wall Type	300	14,970	265	14,575	+13.2	+ 2.7
Heating Pads	1,675	10,888	1,875	12,281	-10.7	-11.3
Hotplates	710	5,929	695	5,908	+ 2.2	+ 0.4
Ironers	91	18,899	160	34,013	-42.9	-44.4
Irons: Total	6,320	95,065	7,575	118,577	-16.6	-19.8
Automatic	2,150	23,543	2,720	32,640	-20.9	-24.9
Non-Automatic	105	415	175	691	-40.0	-40.0
Traveler	440	5,258	430	4,709	+ 2.3	+11.7
Steam	3,625	65,850	4,250	80,538	-14.7	-18.2
Kitchen Cabinets, Steel	3,372	174,440	3,441	178,000	- 2.0	- 2.0
Lamp Bulbs & Tubes, Total	2,148,200	823,000	2,201,159	813,500	- 2.4	+ 1.5
Fluorescent	86,200	128,000	84,665	121,000	+ 1.8	+ 5.8
Incandescent, Large	955,000	275,000	967,461	264,000	- 2.2	+ 4.2
Photo	460,000	76,200	485,670	83,200	- 5.3	- 8.4
Miniature	380,000	112,000	427,363	120,800	-11.1	- 7.3
Christmas	267,000	31,800	227,000	24,500	+17.6	+29.8
Lawn Mowers, Power	1,350	121,095	1,275	144,542	+ 5.9	-16.2
Mixers, Food:						
Standard	1,155	51,189	1,270	55,880	- 9.1	- 8.5
Portable	795	15,503	615	11,654	+29.3	+33.0
Oil Space Heaters	520	49,920	648	60,893	-19.7	-18.0
Radio:						
Home Radios	3,140	99,275	4,403	138,695	-28.7	-34.9
Portable Radios	1,525	48,541	1,742	60,712	-12.4	-20.0
Clock Radios	1,750	54,329	2,041	69,397	-14.3	-21.7
Ranges	1,165	804,063	1,250	318,750	- 6.8	- 4.6
Refrigerators	3,425	1,044,625	3,650	1,076,750	- 6.2	- 3.0
Roasters	350	13,983	395	17,380	-11.4	-19.5
Shavers	3,950	108,625	3,500	94,500	+12.8	+14.9
Television	7,300	1,737,400	7,215	2,020,200	+ 1.2	-14.0
Toasters, Total	3,100	52,595	3,170	57,721	- 2.2	- 8.9
Automatic	2,690	50,975	2,825	56,359	- 4.8	- 9.6
Non-Automatic	410	1,620	345	1,363	+18.8	+18.8
Waffle Irons—Sand. Grills	835	15,823	1,370	29,455	-39.1	-46.3
Washing Machines:						
Automatic & Semi-Auto.	2,420	657,030	2,071	577,401	+16.9	+13.8
Wringer & Spinner	1,230	182,753	1,521	228,018	-19.1	-19.9
Water Heaters, Storage	775	100,750	780	102,960	- 0.6	- 2.1
Water Systems	728	123,400	702	119,000	+ 3.7	+ 3.7

Distribution of 1954 Appliance Sales by Regions

	Domestic & Farm Electric Customers Jan. 1, 1955 Number	%	Shipments by Percent of U. S. Total: Washers (9 Mos.)	Ironers (9 Mos.)	Dryers (9 Mos.)	Refrigerators (9 Mos.)	Freezers (9 Mos.)	Ranges (9 Mos.)	Water Heaters (9 Mos.)	Television (8 Mos.)	Radio (8 Mos.)
New England	2,937,575	6.56	6.29	4.38	4.11	5.89	2.68	8.10	5.65	6.78	7.20
Middle Atlantic	8,905,575	19.89	19.60	19.09	17.24	21.44	12.42	14.55	13.35	18.84	29.23
East North Central	9,336,700	20.85	20.90	31.54	37.23	21.97	21.08	19.76	21.77	20.56	21.42
West North Central	4,227,350	9.44	8.75	12.26	11.21	8.91	15.28	8.14	10.27	9.96	6.99
South Atlantic	5,911,075	13.20	13.14	7.66	6.14	14.20	16.64	21.65	27.07	14.22	11.48
East South Central	2,831,950	6.32	5.86	1.70	2.16	6.13	9.05	9.04	6.06	5.80	4.36
West South Central	4,082,875	9.11	9.60	6.98	3.61	9.28	12.73	4.14	2.30	10.63	7.15
Mountain	1,510,875	3.37	3.43	4.98	2.72	3.01	4.25	4.28	3.72	3.22	2.44
Pacific	5,043,500	11.26	12.43	11.51	15.58	10.07	5.87	10.34	9.81	9.99	9.73
Total	44,787,475	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Electrical Industry Statistics

Station Economics

Manufacturing

New Capacity

Revenue

Financial

Transmission

Distribution

Construction

Canada

Budget

Production

REA

Customers

Capacity Changes

The Statistics Summarized

TOTAL ELECTRIC UTILITY INDUSTRY

		1947	1948	1949	1950	1951	1952	1953	1954*
CUSTOMERS (1,000)	Total	38,432	40,722	42,851	44,906	46,823	48,459	49,899	51,235
	Rural[1]	1,522	1,695	1,804	1,896	1,959	1,943	1,922	1,929
	Residential	31,622	33,549	35,375	37,533	39,225	40,748	41,982	43,135
	Small Light and Power	4,961	5,132	5,291	5,466	5,528	5,624	5,863	6,015
	Large Light and Power	191	204	232	235	248	256	272	282
	Other	136	142	148	158	163	158	160	166
ENERGY SALES (1,000,000 kwhr)	Total	217,581	240,760	248,542	280,539	318,168	342,534	384,264	409,500
	Rural[1]	5,551	6,327	7,304	7,400	8,479	8,536	9,613	10,200
	Residential	44,171	50,978	58,139	67,899	77,934	85,789	96,997	108,100
	Small Light and Power	38,379	43,193	46,262	50,446	57,278	62,088	69,274	74,900
	Large Light and Power	113,523	124,088	120,766	139,065	157,827	167,358	190,010	197,500
	Other	15,957	16,154	15,991	16,599	17,560	17,770	18,330	18,700
REVENUE ($1,000,000)	Total	3,853	4,313	4,614	5,086	5,648	6,157	6,794	7,370
	Rural[1]	124	141	161	158	175	186	202	214
	Residential	1,366	1,533	1,716	1,932	2,165	2,401	2,688	2,910
	Small Light and Power	1,081	1,153	1,229	1,334	1,462	1,564	1,749	1,887
	Large Light and Power	1,197	1,251	1,263	1,405	1,572	1,684	1,884	1,945
	Other	225	237	245	258	273	294	301	314
PRODUCTION (1,000,000 kwhr)	Total	255,739	282,698	291,099	329,141	370,673	399,224	442,665	472,215
	Fuel	177,314	200,228	201,351	233,205	270,922	294,121	337,421	365,819
	Hydro	78,425	82,470	89,748	95,938	99,751	105,102	105,253	106,396
CAPACITY (1,000 kw)	Total	52,322	56,560	62,100	68,919	75,775	82,226	91,302	102,000
	Fuel	37,351	40,908	46,446	51,244	56,907	61,807	69,457	78,825
	Hydro	14,971	15,652	16,654	17,675	18,868	20,419	22,013	23,175
FUEL CONSUMPTION	Coal (1,000 tons)	89,530	99,950	83,960	91,870	105,768	107,070	115,894	117,250
	Oil (1,000 bbl)	45,508	42,644	66,306	75,420	63,945	67,220	82,306	64,750
	Gas (billion cu ft)	375	478	550	628	764	910	1,032	1,175
	Pounds of coal per kwhr	1.31	1.30	1.24	1.19	1.10	1.10	1.06	0.99
CONSTRUCTION EXPENDITURES	($1,000,000)	1,569	2,418	2,954	3,118	3,151	3,760	4,064	4,015

POWER COMPANIES

INCOME and OUTGO ($1,000,000)	Operating revenue	3,480	3,886	4,113	4,510	5,005	5,426	5,940	6,305
	Operating expenses	1,701	2,019	2,030	2,158	2,400	2,577	2,801	2,845
	Taxes	664	712	794	948	1,150	1,224	1,339	1,447
	Net Income	656	666	765	831	823	966	1,041	1,165
	Dividends	500	499	655	626	658	732	788	863
	Balance to Surplus	156	167	110	205	165	224	253	302
FINANCIAL	Electric Plant[2] ($1,000,000)	13,611	15,215	17,164	18,806	20,622	22,967	25,597	28,000
	Securities issued ($1,000,000)	1,577	1,451	1,793	1,768	1,442	1,706	1,957	2,048
	New capital	567	1,315	1,445	1,308	1,432	1,694	1,939	1,761
	Refunding	1,010	136	348	460	10	12	18	287

* Estimated, generally on ten months' operation. [1] On specific rural rates only. [2] Class A and B companies only.

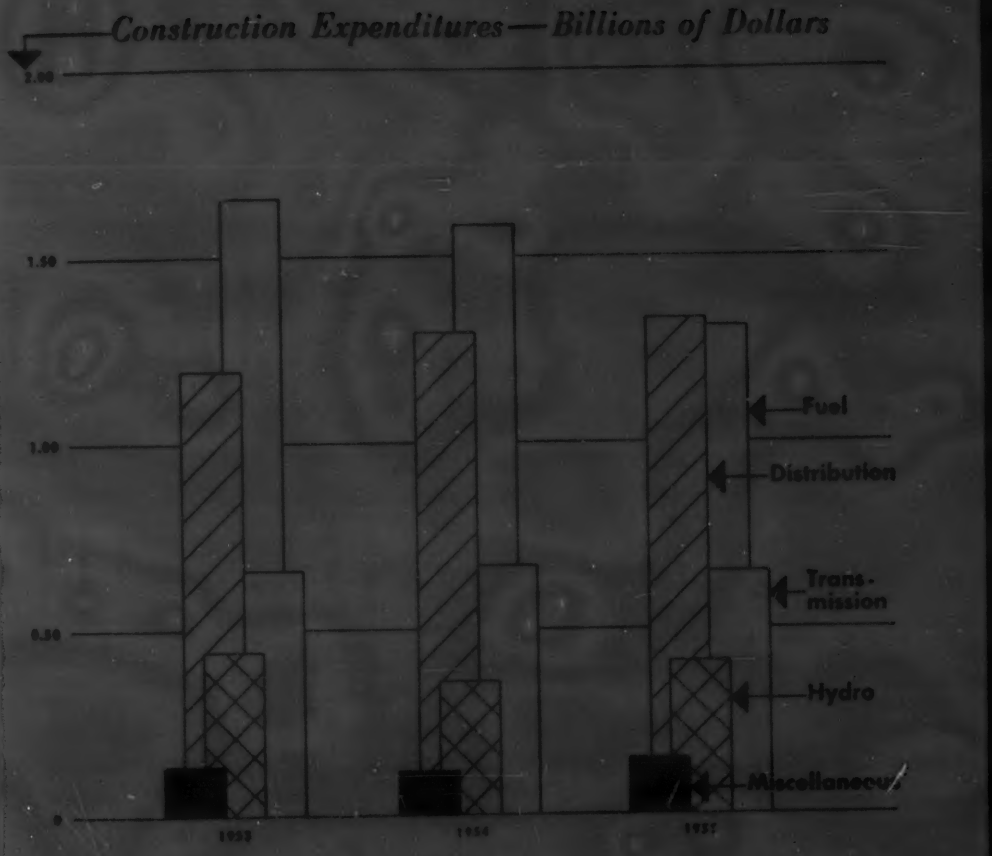
Budget

KEY TO '55—MORE FOR DISTRIBUTION

Accenting the utilities $3.9-billion construction program for 1955 will be outlays for distribution. Spending at the rate of $1,334 million tops all other construction budget items.

As in 1954 less will be spent for generating facilities, more for transmission and distribution. Fuel outlays are down $267 million from 1954 to $1,313 million. In spite of a gain in hydro construction total generating portion of the budget was dropped $220 million below last year. In particular, power companies will spend $176 million less in fuel generation while federal agencies and cooperatives show a drop of over 40%.

Effect of this is that transmission and distribution expenditures now combine to over half the total budget. The gain, however, is all in distribution. Transmission budgets were cut $14 million from $666 million in 1954 to $652 this year. As a per cent of the total 1955 budget, power companies upped their share slightly to 72%. Municipals increased to 11%, cooperatives were down to 4%, and federal agencies down to 13%.



Construction—Thousands of Dollars and % Total U. S.

Source: "Electrical World" Surveys. All bars from left to right: 1953, 1954, 1955

Construction plans on a regional basis reveal the same general trends suggested by the national totals. All regions are planning to cut fuel capacity additions next year while with only two exceptions, East North Central and East South Central, all regions willing be upping their distribution budgets.

New England, Middle Atlantic and West South Central are the only regions

Capital Expenditures — Millions of Dollars

	Generation	Transmission	Distribution	Miscellaneous	Total
1948	1,103	400	1,278	84	2,865
1949	1,410	406	1,457	93	3,360
1950	1,275	425	1,333	109	3,142
1951	1,344	504	1,172	131	3,151
1952	1,925	577	1,118	118	3,738
1953	2,088	647	1,200	127	4,062
1954	1,939	666	1,288	122	4,016
1955†	1,720	652	1,334	154	3,859

Source: Electrical World Surveys. † Prospective.

Coverage of Electrical World's 1954-1955 Survey

	Percentage of group reporting on basis of:		Group's share of U. S. total:	
	Capacity	Customers	Capacity	Customers
Power Companies	98.6%	96.0%	77.9%	78.3%
Municipal, State and Power District Systems	61.0%	68.0%	9.6%	13.7%
Cooperatives	32.8%	57.8%	0.7%	8.0%
Federal Agencies	100.0%	100.0%	12.4%	0.0%
All Groups	94.0%	85.0%	100.0%	100.0%

planning to spend more in 1955. New England's increase stems largely from a $10 million increase in transmission facilities by power companies. Middle Atlantic's gain is the result of $43 million increase in hydro generation as plans for upper N. Y. State Power Authority projects begin to materialize. West South Central shows a fairly even expansion in all segments of the budget except fuel.

The Year Ahead in Electric Utility Construction

Construction Expenditures—Thousands of Dollars

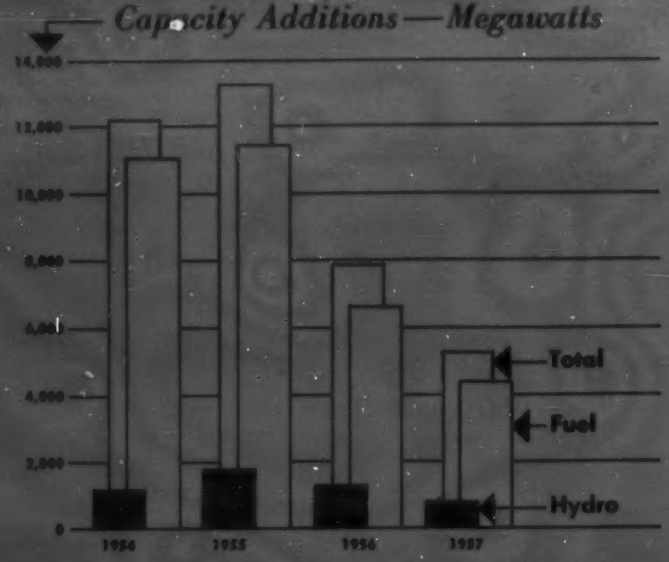
	1954						1953					
	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total	Fuel	Hydro	Transmission	Distribution	Miscellaneous	Total
New England												
Power Companies	41,635	23,295	19,825	71,170	7,125	162,770	36,735	25,815	30,125	75,530	7,209	173,605
Municipal, State and Power District Systems	1,904	237	629	2,659	355	5,696	1,965	19	1,698	5,115	507	9,104
Cooperatives			17	409		429			11	314		325
Federal Agencies												
Total	43,539	23,512	20,525	74,218	7,490	168,884	38,700	25,834	31,834	78,959	7,707	182,834
Middle Atlantic												
Power Companies	188,250	8,720	70,480	223,985	18,315	509,670	145,600	9,775	71,625	251,690	25,925	504,525
Municipal, State and Power District Systems	1,100	6,000	999	3,229	50	10,778	664	50,000	408	3,166	58	54,276
Cooperatives			22	1,747		1,769			44	1,602		1,646
Federal Agencies												
Total	189,350	14,720	70,501	228,961	18,365	522,217	146,264	59,775	72,077	256,348	25,983	560,447
East North Central												
Power Companies	446,950	900	174,750	211,000	23,475	857,125	650,775	1,935	170,600	215,475	31,000	870,305
Municipal, State and Power District Systems	32,955	500	4,166	22,677	2,612	62,809	27,391	169	2,034	16,600	544	46,878
Cooperatives	5,875		2,015	13,991	467	22,348	3,150		2,430	11,532	617	17,574
Federal Agencies		74				74		66				66
Total	485,780	1,623	180,931	247,668	26,554	942,356	681,316	2,170	174,864	243,702	32,761	934,813
West North Central												
Power Companies	64,350	1,560	35,300	67,050	10,140	178,600	44,300	1,670	42,500	75,675	11,465	175,710
Municipal, State and Power District Systems	19,866		13,809	19,959	2,841	56,475	30,285	186	14,749	21,183	2,559	68,962
Cooperatives	11,638		13,820	28,269	1,478	55,205	6,676		7,451	22,702	1,124	37,953
Federal Agencies		81,683	15,225			96,908		74,361	11,526			85,887
Total	95,854	83,243	78,154	115,278	14,189	386,688	81,361	76,187	76,226	119,560	15,148	368,482
South Atlantic												
Power Companies	146,275	19,450	51,860	140,865	11,200	367,650	116,175	16,450	50,710	146,700	15,875	345,410
Municipal, State and Power District Systems	7,999	103	2,844	8,717	310	19,973	11,552	481	1,983	9,273	1,110	24,199
Cooperatives	144		1,797	16,672	467	19,080			900	15,822	456	17,188
Federal Agencies		29,236	2,350			31,586		27,170	1,250			28,420
Total	152,418	39,789	58,851	166,254	11,977	429,289	127,537	44,101	54,843	171,795	16,951	415,217

East South Central												
Power Companies	28,100	1,145	14,225	28,775	3,845	75,290	32,100	2,255	16,450	28,950	4,450	84,205
Municipal, State and Power District Systems	1,862	.....	8,195	31,371	2,702	44,130	924	.....	5,443	32,098	2,258	40,915
Cooperatives	7,613	.....	3,171	17,919	584	29,287	7,875	.....	5,763	12,188	565	27,371
Federal Agencies	241,000	15,769	55,800	.....	2,329	314,829	140,000	29,475	35,450	.....	2,730	198,655
Total	278,575	16,914	81,391	78,065	8,651	463,596	180,899	22,730	64,505	73,228	9,983	351,346
West South Central												
Power Companies	139,700	.....	39,350	101,650	10,730	291,430	109,550	.....	31,650	108,850	14,109	264,239
Municipal, State and Power District Systems	10,745	2	3,745	13,299	1,657	29,448	30,152	3	3,666	16,851	1,895	52,568
Cooperatives	.....	14	1,556	30,577	785	32,932	.....	.....	1,624	29,984	776	32,384
Federal Agencies	.....	10,633	1,962	.....	.....	12,595	.....	11,928	2,730	.....	.....	14,658
Total	150,445	10,649	46,613	145,526	13,172	366,405	139,702	11,931	59,670	155,685	16,852	363,840
Mountain												
Power Companies	51,225	2,620	16,750	32,900	3,390	106,695	22,625	2,885	15,400	29,915	4,650	73,485
Municipal, State and Power District Systems	7,705	399	1,485	16,365	1,870	25,824	7,095	592	1,501	14,636	3,866	27,689
Cooperatives	8,198	.....	3,660	11,071	506	23,435	1,400	11	1,887	16,484	556	19,338
Federal Agencies	10	9,827	6,423	253	84	16,597	.....	2,229	5,233	229	85	8,776
Total	67,138	12,656	28,318	58,589	5,850	170,551	30,520	5,867	24,021	59,176	8,537	128,119
Pacific												
Power Companies	86,875	31,750	43,525	115,630	9,429	287,209	60,425	23,500	51,875	121,600	15,150	250,450
Municipal, State and Power District Systems	29,821	8,960	10,262	53,795	6,206	109,054	26,292	11,543	15,816	49,419	6,553	109,623
Cooperatives	.....	.....	704	4,528	176	5,408	.....	.....	783	4,200	169	5,152
Federal Agencies	.....	116,652	47,969	.....	.....	164,621	.....	123,258	45,479	.....	.....	168,737
Total	116,706	156,762	102,460	173,953	15,802	565,683	86,717	158,301	93,953	175,119	19,872	533,962
Total United States												
Power Companies	1,191,160	89,230	663,905	995,805	96,850	2,836,230	1,015,735	83,435	600,735	1,054,195	127,575	2,781,725
Municipal, State and Power District Systems	115,967	16,350	65,304	169,871	18,303	365,835	132,129	62,963	67,298	166,393	19,351	434,125
Cooperatives	33,660	14	26,756	125,183	4,463	189,854	19,101	11	21,993	112,753	6,063	157,811
Federal Agencies	241,010	254,274	129,729	253	2,404	627,670	140,000	260,487	101,868	229	2,815	505,399
Total	1,579,605	359,868	885,864	1,290,312	122,020	4,015,669	1,313,004	406,896	681,794	1,333,570	153,796	3,889,060
U. S. Possessions												
Alaska	4,670	30,822	1,692	2,648	179	39,711	663	.....	695	1,949	272	3,179
Hawaii	7,976	.....	1,599	2,317	644	12,527	597	.....	1,795	2,120	331	4,843
Puerto Rico and Virgin Islands	1,282	7,889	2,212	6,837	685	18,905	6,926	10,611	2,998	8,899	1,145	30,699
Total	13,728	38,711	5,494	11,762	1,508	71,903	7,986	10,611	5,488	12,969	1,748	38,102

Source: Electrical World Statistics

New Capacity

FUTURE EXPANSION WILL ADD OVER 40,000 MW



Capacity Additions Reported to Electrical World—Kw†

For details see pages 164-171

	1954	1955	1956	1957	After 1957
Hydro					
Power Companies	101,925	355,075	378,700	35,000	2,737,500
Municipal, State and Power District Systems	90,500	67,350	138,850	30,000	1,660,000
Cooperatives	192	750	1,500	1,000	500
Federal Agencies	950,584	1,389,600	792,833	763,066	3,669,450
Total	1,143,201	1,812,775	1,311,883	829,066	8,067,450
Steam					
Power Companies	8,965,000	7,807,450	5,736,775	3,610,700	5,145,600
Municipal, State and Power District Systems	570,700	796,025	376,875	641,500	793,500
Cooperatives	147,500	.....	50,000	90,000	75,500
Federal Agencies	1,500,000	2,850,000	450,000	.....	.....
Total	11,083,200	11,453,475	6,613,650	4,342,200	6,014,600
Internal Combustion					
Power Companies	17,394	4,500	2,500	1,500	.....
Municipal, State and Power District Systems	15,992	29,368	10,100	9,460	13,250
Cooperatives	3,690	8,150	4,845	1,500	15,035
Federal Agencies	.....	.....	.....	.....	.....
Total	37,076	42,018	17,445	12,460	28,285
Gas Turbines					
Power Companies	6,000	.....	6,000	.....	.....
Municipal, State and Power District Systems	..	..	..	5,000	10,000
Cooperatives	.....	.....	.....	.....	.....
Federal Agencies	.....	.....	.....	.....	.....
Total	6,000	.....	6,000	5,000	10,000
Total					
Power Companies	8,990,319	8,167,025	6,123,975	3,647,200	7,883,100
Municipal, State and Power District Systems	677,192	892,743	525,825	685,960	2,476,750
Cooperatives	151,382	8,900	56,345	92,500	91,035
Federal Agencies	2,450,584	4,239,600	1,242,833	763,066	3,669,450
Total	12,269,477	13,308,268	7,948,978	5,188,726	14,120,335

Source: "Electrical World" Surveys. †Maximum rated capability.

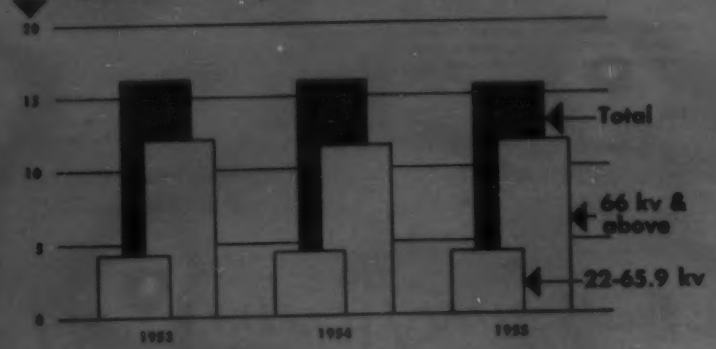
Transmission & Distribution

T & D BUILDING PLANS CALL FOR $1.3 BILLION

Increased spending in most categories of transmission and distribution facilities is in the picture for the utilities in 1955, although in some cases this will mean higher construction costs rather than actual increase in physical construction. Added spending for high and low voltage overhead transmission lines, underground distribution and transmission cable, and substation capacity will up last year's total by $11.3 million. But of that group only high voltage transmission will add more *miles* in 1955 than 1954.

A continuation of the drop in distribution miles to be added is part of the picture for 1955. A decline of about 8% in plans for 1955 will bring the total down from 66,729 pole miles added during 1954 to 61,609—a drop of over 5,100 miles. Most of this drop will be felt in plans for rural line construction. The cooperatives who account for most spending in this area will again be spending less in 1955. In actual miles, the decline will be over 5,500 miles, bringing the 1955 total down to 42,745 miles, a decrease of almost 12%.

Transmission Line Construction—Thousands of Circuit Miles



Transmission & Distribution Construction

	1953	1954	1955
Transmission Line Construction—Circuit Miles	16,245	16,201	16,128
66 kv and up	12,076	11,828	11,849
22—65.9 kv	4,169	4,373	4,279
Primary Distribution Line Construction—Pole Miles	84,756	66,729	61,609
Rural Primary Distribution Line Construction—Pole Miles	64,557	48,437	42,745
Substation Construction—Thousands of Kva	28,154	34,202	34,027
Underground Construction—Cable Miles	2,251	2,883	2,736
Transmission	375	429	368
Distribution	1,876	2,454	2,368

Source: Electrical World Surveys.

The Year Ahead in T&D Construction

Transmission & Distribution Construction

	1954							1955						
	Transmission—Circuit Miles†		Underground—Cable Miles†		Primary Distribution—Pole Miles			Transmission—Circuit Miles†		Underground—Cable Miles†		Primary Distribution—Pole Miles		
	66 kv & up	33-66.9 kv	Transmission	Distribution	Total	Rural	Substations Kva	66 kv & up	33-66.9 kv	Transmission	Distribution	Total	Rural	Substations Kva
New England														
Power Companies	250	115	15	139	940	220	1,234,860	268	115	26	152	965	189	1,320,199
Municipal, State and Power District Systems	.....	13	3	20	52	10	69,000	.....	.....	4	23	30	8	33,000
Cooperatives	.....	2	.....	.....	46	46	5,300	.....	2	.....	.....	41	41	3,000
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	250	130	18	164	1,060	276	1,409,160	268	117	30	175	1,046	229	1,389,199
Middle Atlantic														
Power Companies	562	569	146	974	2,690	1,013	3,723,713	589	582	83	980	2,653	963	3,882,670
Municipal, State and Power District Systems	.....	3	3	1	144	.....	42,000	.....	.....	.....	1	96	.....	73,000
Cooperatives	.....	3	.....	.....	269	269	10,908	.....	6	.....	.....	234	234	15,011
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	562	569	149	975	3,103	1,282	3,776,621	589	588	83	981	2,982	1,186	3,990,681
East North Central														
Power Companies	2,117	746	120	365	6,625	1,525	5,948,494	1,998	866	120	366	6,735	1,995	6,526,693
Municipal, State and Power District Systems	29	17	8	50	365	60	267,900	.....	6	6	52	180	65	247,000
Cooperatives	89	121	.....	.....	2,500	2,500	127,000	102	139	.....	.....	1,963	1,963	131,500
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	2,235	904	128	415	7,388	4,085	6,342,494	2,096	1,011	126	418	6,828	3,963	6,906,193
West North Central														
Power Companies	617	291	1	53	1,489	514	1,444,256	896	318	.....	93	1,630	694	1,215,048
Municipal, State and Power District Systems	106	296	1	171	778	527	777,000	296	276	.....	139	261	326	426,000
Cooperatives	975	371	.....	.....	10,404	10,404	273,100	576	220	.....	.....	8,566	8,566	90,000
Federal Agencies	576	.....	.....	.....	.....	.....	261,000	275	.....	.....	.....	.....	.....	700,000
Total	2,474	968	2	224	12,751	11,925	2,755,456	2,343	814	.....	234	10,647	9,386	2,431,938
South Atlantic														
Power Companies	1,125	267	35	85	5,770	3,275	3,434,212	1,270	241	9	73	5,090	3,129	3,434,525
Municipal, State and Power District Systems	72	30	.....	115	992	216	421,000	.....	9	1	31	982	231	352,000
Cooperatives	136	66	.....	.....	4,518	4,518	126,700	96	52	.....	.....	3,872	3,872	131,765
Federal Agencies	10	.....	.....	.....	.....	.....	56,000	.....	5	.....	.....	.....	.....	140,000
Total	1,331	363	35	200	11,280	8,109	4,237,912	1,366	607	10	104	10,264	7,225	4,058,290

East South Central														
Power Companies	512	157	1	14	1,661	488	1,699,982	312	148	.....	16	1,683	369	1,165,968
Municipal, State and Power District Systems	39	117	11	97	1,497	774	623,000	53	39	.....	80	1,178	645	446,000
Cooperatives	388	50	.....	.....	4,898	4,868	93,200	709	128	.....	.....	3,182	3,182	65,200
Federal Agencies	550	50	.....	.....	.....	.....	3,210,000	425	45	.....	.....	.....	.....	3,900,000
Total	1,481	374	12	111	7,876	6,070	5,626,182	1,099	360	.....	96	6,043	4,196	5,577,100
West South Central														
Power Companies	813	135	.....	86	4,232	1,946	3,344,575	1,198	97	2	65	4,220	1,845	3,401,092
Municipal, State and Power District Systems	85	.....	.....	19	360	4	198,000	75	.....	.....	27	434	4	109,000
Cooperatives	121	156	.....	.....	7,759	7,759	84,000	132	170	.....	.....	8,464	8,464	67,200
Federal Agencies	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	86,000
Total	1,020	291	.....	105	12,351	9,709	3,626,575	1,405	267	2	92	13,128	10,315	3,663,292
Mountain														
Power Companies	550	262	1	24	1,550	886	726,711	436	255	.....	32	1,300	709	788,100
Municipal, State and Power District Systems	144	39	.....	3	212	.....	81,000	35	32	.....	6	196	.....	125,000
Cooperatives	238	267	.....	.....	3,636	3,636	112,200	168	182	.....	.....	4,006	4,006	93,300
Federal Agencies	381	.....	.....	.....	110	97	123,000	162	3	.....	.....	115	100	386,000
Total	1,363	568	1	27	5,508	4,539	1,048,911	791	472	.....	38	5,617	4,815	1,389,000
Pacific														
Power Companies	686	80	.....	188	6,062	3,666	2,155,415	693	122	.....	129	3,850	1,288	1,648,000
Municipal, State and Power District Systems	180	85	84	198	644	289	780,000	256	87	119	122	554	233	1,460,000
Cooperatives	22	98	.....	.....	765	765	60,120	26	114	.....	.....	871	871	68,100
Federal Agencies	364	.....	.....	.....	.....	.....	2,284,000	595	.....	.....	.....	.....	.....	1,577,000
Total	1,172	223	84	231	5,812	2,440	5,388,535	1,570	323	119	242	5,275	2,392	4,741,500
Total United States														
Power Companies	7,402	2,648	319	1,862	26,979	11,331	24,810,658	7,565	2,764	240	1,899	26,556	10,052	23,308,347
Municipal, State and Power District Systems	666	361	110	592	4,852	2,221	3,268,000	1,015	469	128	469	3,839	1,491	3,284,000
Cooperatives	1,929	1,114	.....	.....	34,788	34,788	892,388	1,812	1,013	.....	.....	31,099	31,099	645,296
Federal Agencies	1,881	50	.....	.....	110	97	6,054,000	1,457	53	.....	.....	115	100	6,709,000
Total	11,838	6,373	429	2,454	66,729	48,437	34,991,646	11,849	4,279	368	2,368	61,609	42,745	34,026,553
U. S. Possessions														
Alaska	37	.....	.....	50	3,000	296	86,500	88	32	.....	.....	328	285	36,000
Hawaii	.....	4	6	1	20	.....	20,000	.....	15	2	1	33	.....	30,000
Puerto Rico and Virgin Islands	.....	122	6	15	299	270	57,000	89	49	7	25	37	20	113,000
Total	37	126	12	66	3,319	566	163,500	137	96	9	26	398	305	169,000

Source: Electrical World Surveys (Includes Submarine

Transmission & Distribution Expenditures—Thousands of Dollars

New England

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	9,405	11,115	105	.....	11	11	.....	.....	9,581	11,126
66 kv and up	6,660	9,290	.....	.....	.....	.....	.....	.....	6,660	9,290
22-65.9 kv	2,805	3,825	105	.....	11	11	.....	.....	2,921	3,836
Underground Construction	6,725	9,550	105	255	.....	.....	.....	.....	6,879	10,121
Transmission	1,155	1,410	60	120	.....	.....	.....	.....	1,215	1,530
Distribution	5,535	8,165	170	135	.....	.....	.....	.....	5,764	8,591
Primary Distribution										
Total	21,510	22,200	376	353	192	164	.....	.....	22,760	22,717
Rural	685	750	18	13	192	164	.....	.....	915	927
Substations	15,900	15,825	640	665	60	65	.....	.....	16,623	16,436

Middle Atlantic

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	28,565	28,690	.....	.....	.....	.....	.....	.....	28,565	28,690
66 kv and up	18,670	17,165	.....	.....	.....	.....	.....	.....	18,670	17,165
22-65.9 kv	9,895	9,525	.....	.....	.....	.....	22	44	9,917	9,569
Underground Construction	54,490	60,515	100	90	.....	.....	.....	.....	54,590	60,605
Transmission	10,371	13,165	95	15	.....	.....	.....	.....	10,479	13,180
Distribution	44,119	47,350	5	75	.....	.....	.....	.....	44,124	47,425
Primary Distribution										
Total	46,475	47,475	262	306	1,038	842	.....	.....	47,775	48,623
Rural	2,790	3,460	.....	.....	1,038	842	.....	.....	3,828	4,302
Substations	53,425	64,235	660	1,488	886	890	.....	.....	54,969	66,613

East North Central

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	59,500	70,000	.....	.....	.....	.....	.....	.....	59,500	70,000
66 kv and up	38,000	44,000	.....	.....	.....	.....	.....	.....	38,000	44,000
22-65.9 kv	21,500	26,000	.....	.....	.....	.....	.....	.....	21,500	26,000
Underground Construction	69,500	69,500	.....	.....	.....	.....	.....	.....	69,500	69,500
Transmission	13,500	13,500	.....	.....	.....	.....	.....	.....	13,500	13,500
Distribution	56,000	56,000	.....	.....	.....	.....	.....	.....	56,000	56,000
Primary Distribution										
Total	67,775	68,950	.....	.....	.....	.....	.....	.....	67,775	68,950
Rural	9,700	9,900	.....	.....	.....	.....	.....	.....	9,700	9,900
Substations	84,199	96,115	.....	.....	.....	.....	.....	.....	84,199	96,115

East North Central—Continued

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	260	68	1,662	1,834	.....	.....	.....	.....	62,422	72,677
66 kv and up	225	.....	675	780	.....	.....	.....	.....	49,200	50,820
22-65.9 kv	35	43	917	1,054	.....	.....	.....	.....	13,402	13,857
Underground Construction	1,511	1,224	.....	.....	.....	.....	.....	.....	24,246	24,754
Transmission	201	75	.....	.....	.....	.....	.....	.....	5,206	5,025
Distribution	1,310	1,149	.....	.....	.....	.....	.....	.....	18,860	19,729
Primary Distribution										
Total	2,109	2,143	7,663	5,962	.....	.....	.....	.....	91,947	97,755
Rural	186	165	7,663	5,962	.....	.....	.....	.....	19,237	16,827
Substations	2,995	2,225	1,905	2,104	.....	.....	.....	.....	93,698	101,479

West North Central

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	14,078	21,029	2,572	6,886	10,337	6,113	7,432	3,410	34,725	37,379
66 kv and up	13,000	18,670	770	5,500	7,488	4,424	7,432	3,410	28,110	31,853
22-65.9 kv	1,078	2,359	1,802	1,467	2,849	1,689	.....	.....	6,628	5,536
Underground Construction	4,500	4,917	736	1,488	.....	.....	.....	.....	6,752	6,988
Transmission	241	75	35	.....	.....	.....	.....	.....	276	75
Distribution	4,259	4,879	681	1,484	.....	.....	.....	.....	6,976	6,913
Primary Distribution										
Total	21,000	24,500	6,602	6,721	29,968	17,132	.....	.....	57,570	48,353
Rural	4,725	4,825	1,602	1,962	29,968	17,132	.....	.....	36,295	23,919
Substations	12,000	19,000	10,712	8,481	5,804	991	7,778	6,115	36,294	34,587

South Atlantic

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	26,660	31,573	1,112	1,112	1,278	1,289	.....	.....	29,050	33,974
66 kv and up	21,025	22,860	923	.....	.....	.....	.....	.....	21,948	22,860
22-65.9 kv	5,635	8,713	189	1,112	1,278	1,289	.....	.....	7,102	11,114
Underground Construction	7,250	7,250	853	209	.....	.....	.....	.....	8,103	7,459
Transmission	3,320	1,000	942	.....	.....	.....	.....	.....	4,262	1,000
Distribution	3,930	6,250	191	209	.....	.....	.....	.....	4,121	6,459
Primary Distribution										
Total	51,200	55,625	4,169	3,957	.....	.....	.....	.....	55,369	59,582
Rural	27,225	28,650	250	317	.....	.....	.....	.....	27,475	28,967
Substations	35,175	31,725	2,417	1,673	.....	.....	.....	.....	37,592	33,398

South Atlantic—Continued

	Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955
Transmission Lines	950	750	300	50	25,937	26,894
66 kv and up	650	700	300	.....	22,800	23,540
22-65.9 kv	250	250	.....	50	3,087	3,354
Underground Construction	.....	.....	.....	.....	8,053	8,960
Transmission	.....	.....	.....	.....	3,962	1,000
Distribution	.....	.....	.....	.....	4,121	7,850
Primary Distribution						
Total	.....	.....	.....	.....	79,595	73,252
Rural	.....	.....	.....	.....	1,288	875
Substations	2,650	1,150	60,363	58,118	12,255	10,980

East South Central

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	6,775	8,305	1,938	2,035	3,148	6,696	29,100	13,950	31,953	30,934
66 kv and up	5,940	6,805	913	1,500	2,740	5,672	18,700	12,800	27,473	26,977
22-65.9 kv	1,735	1,500	945	463	408	1,024	1,400	1,150	4,480	4,957
Underground Construction	2,400	2,500	2,400	2,500	.....	.....	.....	.....	4,800	5,000
Transmission	1,105	1,000	.....	.....	.....	.....	.....	.....	1,105	1,000
Distribution	1,295	1,500	.....	.....	.....	.....	.....	.....	1,295	1,500
Primary Distribution										
Total	1,795	1,795	.....	.....	.....	.....	.....	.....	1,795	1,795
Rural	1,795	1,795	.....	.....	.....	.....	.....	.....	1,795	1,795
Substations	2,400	2,400	2,400	2,500	.....	.....	.....	.....	4,800	4,900

West South Central

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Total	
	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	17,550	21,930	1,848	1,128	1,278	1,289	20,676	24,347
66 kv and up	15,500	20,100	1,848	1,128	950	650	18,298	21,878
22-65.9 kv	2,050	1,750	.....	.....	328	639	2,378	2,389
Underground Construction	3,100	2,600	256	256	.....	.....	3,356	2,856
Transmission	1,202	500	.....	.....	.....	.....	1,202	500
Distribution	1,794	2,074	3,100	2,629	256	210	5,150	4,913
Primary Distribution								
Total	33,810	33,800	2,642	2,940	22,191	22,686	58,643	59,426
Rural	14,088	9,710	71	39	22,191	22,686	36,350	32,435
Substations	31,000	32,300	2,326	2,578	1,504	1,277	34,830	36,155

West South Central—Cont.

	Federal Agencies		Total	
	1954	1955	1954	1955
Transmission Lines	.....	.....	19,872	24,457
66 kv and up	.....	.....	16,904	21,918
22-65.9 kv	.....	.....	2,968	2,542
Underground Construction	.....	.....	3,358	2,905
Transmission	.....	.....	75	.....
Distribution	.....	.....	3,286	2,830
Primary Distribution				
Total	.....	.....	38,688	50,746
Rural	.....	.....	29,297	29,345
Substations	1,125	35,822	37,280	10,620	8,960	955	2,688	2,566	1,846	2,688	3,923	17,457	16,767

Mountain

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	6,416	6,295	1,132	688	2,329	1,715	2,771	1,292	14,646	9,710
66 kv and up	4,830	4,985	1,020	538	1,117	633	2,771	1,283	11,768	7,429
22-65.9 kv	1,586	1,310	102	70	1,211	892	.....	9	2,878	2,281
Underground Construction	1,350	2,905	50	780	154	.....	.....	.....	1,982	934
Transmission	.....	75	.....	.....	.....	.....	.....	.....	32	.....
Distribution	1,386	2,830	817	780	153	154	.....	.....	2,396	6,360
Primary Distribution										
Total	14,250	14,250	547	284	7,272	9,214	163	165	22,232	23,970
Rural	6,920	6,920	.....	.....	7,272	9,214	119	125	14,306	16,369
Substations	8,960	8,960	955	2,688	2,566	1,846	3,688	3,923	17,457	16,767

Pacific

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	19,480	18,560	5,606	7,123	480	560	29,006	26,006
66 kv and up	14,660	14,260	5,971	6,855	88	101	20,008	21,006
22-65.9 kv	2,810	3,020	374	1,068	392	456	.....	.....
Underground Construction	6,435	6,360	7,951	7,893	.....	.....	.....	.....
Transmission	40	.....	5,015	5,200	.....	.....	.....	.....
Distribution	6,395	6,360	2,936	2,685	.....	.....	.....	.....
Primary Distribution								
Total	45,675	46,110	11,426	11,655	2,681	2,613	.....	.....
Rural	7,480	7,115	1,163	788	2,681	2,613	.....	.....
Substations	21,385	19,875	17,903	18,919	962	770	18,961	20,570

Pacific—Continued

	Total	
	1954	1955
Transmission Lines	51,816	51,649
66 kv and up	51,240	47,105
22-65.9 kv	3,576	4,544
Underground Construction	14,308	14,253
Transmission	5,055	5,200
Distribution	9,531	9,048
Primary Distribution		
Total	59,782	59,250
Rural	17,294	10,516
Substations	64,301	59,965

Total United States

	Power Companies		Municipal, State & Power District Systems		Cooperatives		Federal Agencies		Total	
	1954	1955	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	188,730	212,835	14,135	17,645	20,126	19,112	69,631	43,788	292,620	293,380
66 kv and up	150,600	173,105	10,523	14,399	13,284	12,900	58,231	43,579	232,648	242,973
22-65.9 kv	38,130	39,730	3,552	3,255	6,850	6,212	1,400	1,209	49,932	50,406
Underground Construction	107,777	112,435	14,225	13,444	.....	.....	.....	.....	122,002	125,879
Transmission	20,755	22,653	7,275	5,695	.....	.....	.....	.....	28,030	28,346
Distribution	87,022	89,782	6,950	7,751	.....	.....	.....	.....	93,974	97,543
Primary Distribution										
Total	330,890	347,600	26,720	26,396	29,667	72,941	163	158	407,470	495,992
Rural	63,250	60,200	6,138	4,863	29,667	72,941	119	125	159,196	137,324
Substations	285,730	300,900	42,779	43,309	15,847	12,762	67,522	56,462	411,858	412,364

U. S. Possessions

	Alaska		Hawaii		Puerto Rico & Virgin Islands		Total	
	1954	1955	1954	1955	1954	1955	1954	1955
Transmission Lines	156	316	21	157	1,168	2,520	1,345	2,993
66 kv and up	111	144	.....	.....	.....	1,761	111	1,905
22-65.9 kv	45	172	21	157	1,156	759	1,234	1,088
Underground Construction	270	.....	680	897	834	1,482	1,784	2,179
Transmission	30	.....	290	250	710	1,482	1,030	1,732
Distribution	240	.....	390	240	124	200	754	440
Primary Distribution								
Total	1,335	932	876	891	4,671	67	6,882	1,850
Rural	947	932	.....	.....	4,486	28	5,433	932
Substations	1,409	466	607	61	1,078	2,045	3,093	2,572

Maintenance

'55 MAINTENANCE OVER ½ BILLION

Utilities expect to spend $30 million more in maintenance this year, $592 million. Power companies alone will spend close to 80% of this while federal agencies expect a 37% jump from $24.6 million in 1954 to $33.7 million in 1955.

Largest regional maintenance figures are in the Northeast which with East North Central and Middle Atlantic states accounts for 46% of the nationwide total. Wide gains in the East South Central and Mountain areas reflect the big increase by federal projects.

Maintenance—Thousands of Dollars

	1954	1955
New England		
Power Companies	35,565	33,600
Municipal, State and Power District Systems	787	7,246
Cooperatives	77	78
Federal Agencies		
Total	36,429	40,924
Middle Atlantic		
Power Companies	135,875	135,675
Municipal, State and Power District Systems	1,480	796
Cooperatives	412	417
Federal Agencies		
Total	137,767	136,888
East North Central		
Power Companies	116,135	122,350
Municipal, State and Power District Systems	8,950	9,197
Cooperatives	2,668	2,704
Federal Agencies	100	100
Total	127,853	134,351
West North Central		
Power Companies	30,325	31,415
Municipal, State and Power District Systems	12,263	12,931
Cooperatives	7,167	7,328
Federal Agencies	427	881
Total	50,182	52,555
South Atlantic		
Power Companies	54,825	55,275
Municipal, State and Power District Systems	3,184	3,462
Cooperatives	3,442	3,520
Federal Agencies	1,008	1,008
Total	62,459	63,265
East South Central		
Power Companies	11,725	12,550
Municipal, State and Power District Systems	11,239	11,235
Cooperatives	2,784	2,860
Federal Agencies	8,889	11,489
Total	34,637	38,124
West South Central		
Power Companies	32,500	33,850
Municipal, State and Power District Systems	2,706	2,704
Cooperatives	3,544	3,669
Federal Agencies	886	1,089
Total	39,636	41,402
Mountain		
Power Companies	9,450	10,675
Municipal, State and Power District Systems	1,784	1,731
Cooperatives	2,136	2,233
Federal Agencies	8,548	13,281
Total	21,918	27,920
Pacific		
Power Companies	31,725	35,875
Municipal, State and Power District Systems	14,756	14,697
Cooperatives	620	645
Federal Agencies	4,693	5,830
Total	51,794	57,047
Total United States		
Power Companies	458,125	471,265
Municipal, State and Power District Systems	57,149	64,089
Cooperatives	22,850	23,444
Federal Agencies	24,551	33,678
Total	562,675	592,476
U. S. Possessions		
Alaska	2,367	1,298
Hawaii	2,240	2,148
Puerto Rico & Virgin Islands	27	34
Total	4,634	3,476

Customers and % Total U.S.

Source: Edison Electric Institute, 1954 estimated. All bars from left to right: 1944, 1953, 1954

One of the industry "significant figures" for 1954 was the addition of the 50 millionth customer sometime last summer. At year-end the total had been brought up to 51,235,000, over 1½ times 10 years ago and an increase of 1.3 million over last year.

Residential customers, representing 84% of the total, went up over a million during the year to reach 43.1 million by December, another 1½ fold increase over a decade ago.

Adding the 1.6 million rural customers in the country to the residential total means there is one residential and rural customer for every 3.6 persons in the country. As a result of this ever-improving ratio and the ever-nearing 100% electrified homes and farms, it is to be expected that the rate of customer growth will be smaller in the future.

Customers

	Residential			Rural*			Small Light & Power		
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	% Total	Annual Change
1938	23,111,762	82.3	739,377 (3.3%)	526,238	1.9	7,356 (1.4%)	4,127,357	14.7	55,734 (1.4%)
1939	23,965,035	82.3	853,273 (3.7%)	634,249	2.2	108,011 (20.5%)	4,215,254	14.5	87,897 (2.1%)
1940	24,951,906	82.6	986,871 (4.1%)	685,812	2.3	51,563 (8.1%)	4,260,255	14.1	45,001 (1.1%)
1941	26,025,513	82.3	1,073,607 (4.3%)	986,719	3.1	300,907 (43.9%)	4,299,976	13.6	39,721 (0.9%)
1942	26,620,456	82.6	594,943 (2.3%)	1,095,512	3.4	108,793 (11.0%)	4,219,457	13.1	−80,519 (1.9%)
1943	26,872,689	82.9	252,183 (0.9%)	1,088,698	3.4	−6,814 (0.6%)	4,168,245	12.8	−51,212 (1.2%)
1944	27,371,260	82.8	498,621 (1.9%)	1,144,241	3.5	55,543 (5.1%)	4,263,395	12.9	95,150 (2.3%)
1945	28,116,998	82.6	745,738 (2.7%)	1,234,441	3.6	90,200 (7.9%)	4,398,184	12.9	134,789 (3.2%)
1946	29,769,107	82.3	1,652,109 (5.9%)	1,381,291	3.8	146,850 (11.9%)	4,692,850	13.0	294,666 (6.7%)
1947	31,621,959	82.2	1,852,852 (6.2%)	1,522,136	4.0	140,845 (10.2%)	4,960,895	12.9	268,045 (5.7%)
1948	33,549,396	82.4	1,927,437 (6.1%)	1,694,579	4.1	172,443 (11.3%)	5,131,730	12.6	170,835 (3.4%)
1949	35,375,366	82.6	1,825,970 (5.4%)	1,804,415	4.2	109,836 (6.5%)	5,290,768	12.3	159,038 (3.1%)
1950	37,532,549	83.4	2,157,183 (6.1%)	1,596,146	3.5	−208,269 (11.5%)	5,466,181	12.2	175,413 (3.3%)
1951	39,224,621	83.5	1,692,072 (4.5%)	1,658,728	3.5	62,582 (3.9%)	5,528,117	11.8	61,936 (1.1%)
1952	40,747,518	84.1	1,522,897 (3.9%)	1,663,201	3.4	4,473 (2.7%)	5,684,130	11.6	106,013 (1.9%)
1953	41,981,633	84.1	1,234,115 (3.0%)	1,621,810	3.3	−41,391 (2.6%)	5,865,210	11.8	229,080 (4.1%)
1954‡	43,135,200	84.2	1,153,567 (2.7%)	1,638,400	3.2	16,590 (1.0%)	6,083,000	11.7	151,790 (2.6%)

	Large Light & Power			Other Classifications			Total	
	Customers	% Total	Annual Change	Customers	% Total	Annual Change	Customers	Annual Change
1938	191,722	0.7	5,540 (2.8%)	106,631	0.4	4,474 (4.4%)	28,063,710	801,391 (2.9%)
1939	184,299	0.6	−7,423 (3.9%)	106,469	0.4	−162 (1.5%)	29,105,306	1,041,596 (3.7%)
1940	177,904	0.6	−6,394 (3.5%)	115,123	0.4	8,654 (8.1%)	30,191,001	1,085,695 (3.7%)
1941	172,677	0.6	−5,228 (2.9%)	122,486	0.4	7,363 (6.4%)	31,607,371	1,416,370 (4.7%)
1942	169,928	0.5	−22,749 (13.2%)	125,387	0.4	2,901 (2.1%)	32,210,440	603,069 (1.9%)
1943	166,593	0.5	−3,335 (2.2%)	120,125	0.4	−4,962 (4.0%)	32,396,300	185,860 (0.6%)
1944	161,652	0.4	−5,059 (3.5%)	117,044	0.4	−2,281 (1.9%)	33,048,392	652,092 (2.0%)
1945	162,338	0.5	10,686 (7.0%)	119,112	0.4	1,268 (1.1%)	34,031,073	982,681 (3.0%)
1946	174,662	0.5	12,324 (7.6%)	122,381	0.3	3,269 (2.7%)	36,140,291	2,109,218 (6.2%)
1947	191,363	0.5	16,701 (9.6%)	135,597	0.4	13,216 (10.8%)	38,431,950	2,291,659 (6.3%)
1948	204,230	0.5	12,867 (6.7%)	142,053	0.3	6,456 (4.8%)	40,721,908	2,290,038 (6.0%)
1949	232,125	0.5	27,895 (13.7%)	148,107	0.3	6,054 (4.3%)	42,850,781	2,128,793 (5.2%)
1950	234,728	0.5	2,603 (1.1%)	156,690	0.3	8,583 (5.8%)	44,986,294	2,135,513 (5.0%)
1951	247,532	0.5	12,804 (5.5%)	162,881	0.3	6,191 (4.0%)	46,821,879	1,835,585 (4.1%)
1952	256,294	0.5	8,762 (3.5%)	158,228	0.3	−4,653 (2.9%)	48,459,371	1,637,492 (3.5%)
1953	271,947	0.5	15,653 (6.1%)	160,465	0.3	2,237 (1.4%)	49,899,065	1,439,694 (3.0%)
1954	282,000	0.6	10,055 (4.1%)	164,400	0.3	3,935 (2.5%)	51,235,000	1,335,935 (2.7%)

Source: Edison Electric Institute * Customers served under distinctly rural rates. ‡ Estimated.

Sales of Electric Energy—Millions of Kwhr and % Total U. S.

Source: Edison Electric Institute, 1954 estimated. All bars from left to right: 1944, 1953, 1954

Sales of Electric Energy—Millions of Kwhr

	Residential			Rural*			Small Light & Power		
	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	% Total	Annual Change
1938	19,371	20.7	1,680 (9.5%)	1,577	1.7	−93 (5.6%)	19,137	20.4	1,062 (5.9%)
1939	21,084	19.9	1,713 (8.8%)	1,881	1.7	304 (19.3%)	20,722	19.6	1,585 (8.3%)
1940	23,317	19.7	2,233 (10.6%)	1,991	1.7	110 (5.8%)	22,373	18.8	1,651 (8.0%)
1941	25,124	17.9	1,807 (7.7%)	2,352	1.7	361 (18.1%)	24,628	17.6	2,255 (10.1%)
1942	25,937	16.9	1,813 (7.2%)	2,890	1.8	538 (22.9%)	27,233	17.1	2,605 (10.6%)
1943	28,621	15.4	1,684 (6.3%)	2,996	1.6	106 (3.7%)	28,192	15.2	959 (3.5%)
1944	31,266	15.7	2,645 (9.2%)	3,373	1.7	377 (13.6%)	29,837	15.1	1,645 (5.8%)
1945	34,184	17.7	2,918 (9.3%)	3,669	1.9	296 (8.8%)	30,438	15.7	601 (2.0%)
1946	38,571	20.3	4,387 (12.8%)	4,431	2.3	762 (20.8%)	33,016	17.3	2,578 (8.5%)
1947	44,171	20.3	5,600 (14.5%)	5,551	2.5	1,120 (25.3%)	38,379	17.6	5,363 (16.3%)
1948	50,978	21.2	6,807 (15.4%)	6,327	2.6	776 (14.0%)	43,193	17.9	4,814 (12.5%)
1949	58,189	23.4	7,161 (14.0%)	7,384	3.0	1,057 (16.7%)	46,262	18.6	3,069 (7.1%)
1950	67,020	23.9	8,891 (15.3%)	7,400	2.6	16 (0.2%)	50,446	18.0	4,184 (9.0%)
1951	77,024	24.2	9,994 (14.9%)	8,479	2.7	1,079 (14.6%)	57,278	18.0	6,832 (13.5%)
1952	86,780	25.3	9,756 (12.7%)	8,536	2.5	57 (0.7%)	62,080	18.1	4,802 (8.4%)
1953	96,997	25.2	10,217 (11.8%)	9,613	2.5	1,077 (12.6%)	69,274	18.0	7,194 (11.6%)
1954†	108,100	26.1	11,103 (11.1%)	10,300	2.5	687 (7.1%)	74,900	18.3	5,626 (8.1%)

	Large Light & Power			Other Classifications			Total	
	Sales	% Total	Annual Change	Sales	% Total	Annual Change	Sales	Annual Change
1938	43,140	46.0	−8,219 (16.0%)	10,506	11.2	−58 (0.5%)	93,731	−5,608 (5.6%)
1939	51,108	48.3	7,958 (18.5%)	10,972	10.4	466 (4.4%)	105,767	12,036 (12.8%)
1940	59,557	50.2	8,449 (16.5%)	11,485	9.6	435 (3.9%)	118,643	12,876 (12.2%)
1941	76,061	54.3	16,504 (27.7%)	11,895	8.5	490 (4.3%)	140,060	21,957 (18.5%)
1942	88,378	53.4	12,317 (16.2%)	13,969	8.8	2,074 (17.4%)	159,407	18,807 (13.4%)
1943	108,657	57.4	18,279 (20.7%)	19,423	10.4	5,454 (3.9%)	185,889	26,482 (16.6%)
1944	115,187	58.1	8,530 (8.0%)	18,497	9.3	−926 (4.8%)	198,160	12,271 (6.6%)
1945	107,490	55.5	−7,697 (6.7%)	17,777	9.2	−720 (3.9%)	193,538	−4,602 (2.3%)
1946	98,885	51.8	−8,605 (8.0%)	15,892	8.3	−1,885 (10.6%)	190,795	−2,763 (1.4%)
1947	115,523	52.2	16,638 (14.8%)	15,957	7.3	65 (0.4%)	217,581	26,786 (14.0%)
1948	124,088	51.6	10,565 (9.3%)	16,154	6.7	197 (1.2%)	240,740	23,159 (10.6%)
1949	120,766	48.6	−3,322 (2.7%)	15,991	6.4	−163 (1.0%)	248,542	7,802 (3.2%)
1950	139,063	49.5	18,299 (15.2%)	16,598	5.9	607 (3.8%)	280,539	31,997 (12.9%)
1951	157,827	49.6	18,762 (13.5%)	17,560	5.5	962 (5.8%)	318,148	37,629 (13.4%)
1952	167,358	48.9	9,531 (6.0%)	17,770	5.2	210 (1.2%)	343,524	24,356 (7.7%)
1953	190,010	49.5	22,652 (13.5%)	18,350	4.8	580 (3.3%)	384,244	41,720 (12.2%)
1954	197,500	48.2	7,490 (3.9%)	18,700	4.6	350 (1.9%)	409,500	25,256 (6.6%)

Source: Edison Electric Institute. * Sales on distinct rural rates. †Estimated.

In spite of the recessionary period of 1954, total energy sales rose by 25.2 billion kwhr in 1954 to a year-end total of 409.5 billion kwhr. Sales to large light and power customers, representing almost half this total, increased 7.5 billion kwhr, having been buoyed up by the ever increased power needs of the atomic energy projects.

Sales to residential customers showed little of the effect of the decline in business activity. In magnitude sales registered a record increase of 11 billion kwhr, totalling 108.1 billion kwhr by December.

Small light and power customers accounted for 75 billion kwhr in sales at year-end, an 8% increase over 1953. Together, the three groups accounted for about 93% of all power purchased during the year.

Energy Production — Millions of Kwhr and % Total U. S.

Source: Federal Power Commission, 1954 estimated. All bars left to right: 1944, 1953, 1954

A gain of over 28 Billion kwhr in fuel power generation accounted for 96% of the total production increase during 1954. Hydro generation advanced by a little over a billion kwhr, combining with fuel to bring total production up to 472 billion kwhr at year-end—twice what it was 10 years ago.

Power companies generated about 18 billion more kwhr in 1954. Their total production was 372 billion kwhr or 79% of all power produced by December. Production at federal projects at 68 billion kwhr for the year registered a slight percentage gain to 14.5% of total generation. Production by cooperatives, though a minute portion of the whole, advanced over 30% from 1.9 billion kwhr in 1953 to 2.5 billion last year, registering one of the biggest gains on record.

Source and Disposal of Energy—Millions of Kwhr

	Production				Less Energy Used by			
	Fuel	Hydro	Total Production	Add Net Imports	Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
1938	69,533	44,279	113,812	1,867	6,990	108,689	14,958	93,731
1939	84,078	43,564	127,642	1,900	7,734	121,808	16,040	105,768
1940	94,516	47,321	141,837	937	7,268	135,506	16,863	118,643
1941	113,925	50,863	164,788	927	6,335	159,380	19,320	140,060
1942	122,108	63,871	185,979	1,448	6,611	180,816	21,409	159,407
1943	144,127	73,632	217,759	1,537	9,729	209,567	24,678	185,889
1944	154,244	75,945	228,189	1,597	6,541	223,245	25,084	198,161
1945	142,516	79,970	222,486	1,773	3,368	220,891	27,333	193,558
1946	144,772	78,406	223,178	1,666	4,576	220,268	29,474	190,794
1947	177,314	78,425	255,739	1,269	6,186	250,822	33,241	217,581
1948	200,228	82,470	282,698	1,113	6,368	277,443	36,703	240,740
1949	201,351	89,748	291,099	1,004	5,887	286,216	37,675	248,542
1950	233,203	95,938	329,141	1,283	8,445	321,979	41,440	280,539
1951	270,922	99,751	370,673	1,721	9,356	363,838	44,870	318,168
1952	294,121	105,102	399,224	1,758	10,731	390,251	47,727	342,524
1953	337,402	105,233	442,665	1,365	9,398	434,632	50,388	384,244
1954*	365,819	106,396	472,215	1,100	12,315	461,000	51,500	409,500

Source: Federal Power Commission and Edison Electric Institute. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad and Railway classification. * Estimated.

Production of Electric Energy by Ownership—Millions of Kwhr

	Power Companies		Federal Agencies		Municipal, State & Power District Systems		Cooperatives	
	Production	% Total	Production	% Total	Production	% Total	Production	% Total
1938	104,090	91.5	3,029	2.7	6,693†	5.9	.....	.....
1939	115,078	90.2	5,476	4.3	7,088†	5.6	.....	.....
1940	125,411	88.4	8,588	6.1	7,843†	5.5	.....	.....
1941	144,289	87.6	10,794	6.6	9,705†	5.9	.....	.....
1942	158,052	86.0	16,894	9.1	11,033†	5.9	.....	.....
1943	180,248	82.8	24,484	11.2	13,027†	6.0	.....	.....
1944	185,850	81.4	28,866	12.7	13,473†	5.9	.....	.....
1945	180,926	81.3	28,000	12.6	13,560†	6.1	.....	.....
1946	181,020	81.1	26,960	12.1	15,196†	6.8	.....	.....
1947	208,186	81.4	29,877	11.7	17,352	6.9	404	0.2
1948	228,231	80.7	35,373	12.5	18,444	6.5	650	0.2
1949	228,112	80.1	38,102	13.1	19,122	6.6	764	0.3
1950	266,060	81.1	40,387	12.3	20,906	6.4	986	0.3
1951	301,045	81.6	44,120	11.9	23,444	6.3	1,264	0.3
1952	322,126	80.7	52,492	13.2	23,080	5.8	1,526	0.4
1953	354,271	80.0	58,064	13.1	28,433	6.4	1,896‡	0.4
1954*	371,980	78.8	67,660	14.3	30,158	6.4	2,485‡	0.5

Source: Federal Power Commission. † Includes Cooperatives. * Estimated. ‡ Estimated by Electrical World.

Revenue—Thousands of Dollars and % Total U. S.

Source: Edison Electric Institute, 1954 estimated. All bars from left to right: 1944, 1953, 1954

Revenue from energy sales in 1954 topped $7 billion for a 7% increase over 1953. Residential and large light and power sales together represented a source of ⅔ the total income with $4.9 billion while residential revenues alone rose by about $250 million for an even 40% share of total revenues. The $61-million increases in large light and power revenues, however, was at a smaller rate than usual as a result of the drop-off in industrial production earlier in the year.

Revenues from the three northeastern sections of the country, New England, Middle Atlantic and East North Central, made up almost half the nation's total revenues, amounting to $3.6 billion. The next two largest regions, South Atlantic and Pacific, accounted for almost another quarter of the total income.

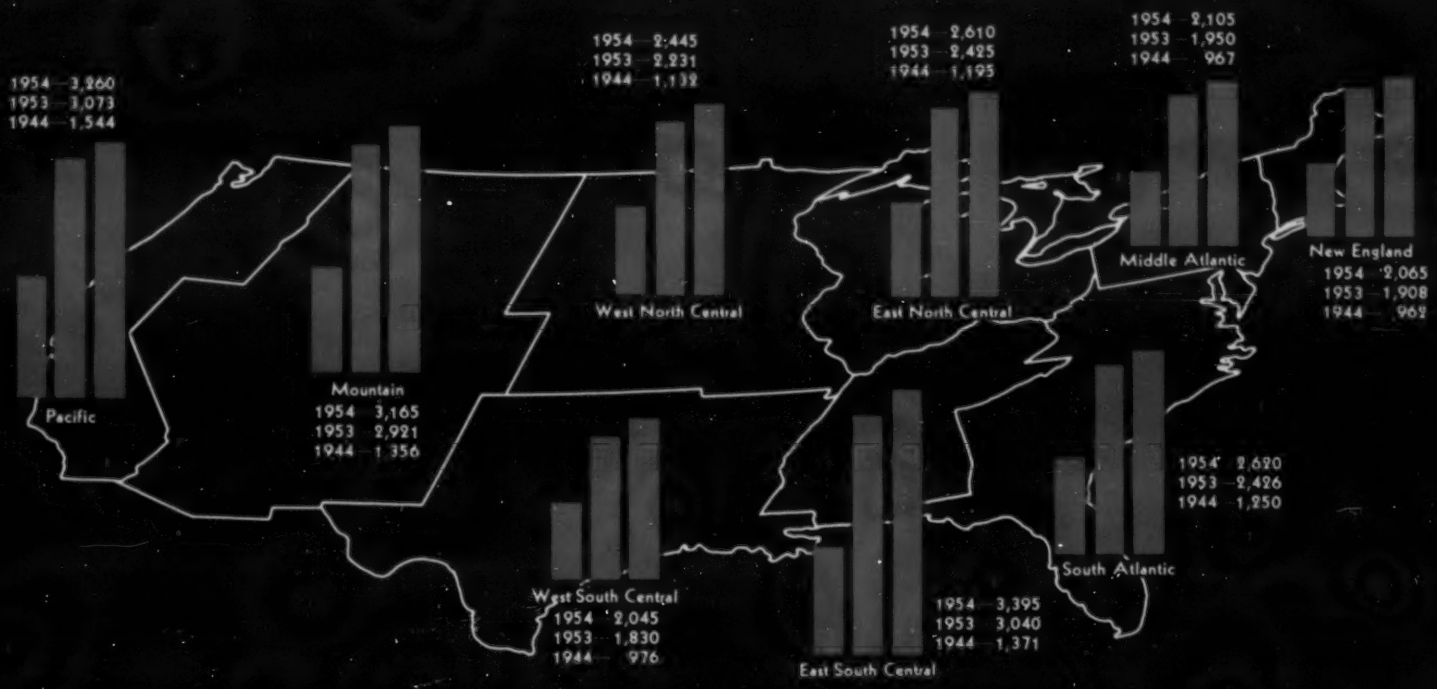
Revenue from Energy Sales—Thousands of Dollars

	Residential			Rural*			Small Light & Power		
	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change
1938	802,532	37.2	42,708 (5.6%)	38,928	1.8	1,202 (3.2%)	632,091	29.3	15,653 (2.5%)
1939	843,158	36.8	40,626 (5.1%)	45,484	2.0	6,556 (16.8%)	660,683	28.9	28,592 (4.5%)
1940	895,951	36.7	52,793 (6.3%)	49,473	2.0	3,989 (8.8%)	689,253	28.2	28,570 (4.3%)
1941	938,229	35.3	42,278 (4.7%)	64,396	2.4	14,923 (30.2%)	725,117	27.2	35,864 (5.2%)
1942	990,185	34.7	51,956 (5.5%)	75,027	2.6	10,631 (16.5%)	767,279	26.9	42,162 (5.6%)
1943	1,029,260	33.4	39,075 (3.9%)	76,617	2.5	1,590 (2.1%)	773,678	25.2	6,399 (0.8%)
1944	1,097,726	33.5	68,466 (6.7%)	82,842	2.5	6,225 (8.1%)	817,355	24.9	43,677 (5.6%)
1945	1,167,356	34.9	69,630 (6.3%)	90,345	2.7	7,503 (9.1%)	850,213	25.4	32,858 (4.0%)
1946	1,240,577	35.9	73,221 (6.3%)	104,876	3.0	14,531 (16.1%)	924,775	26.7	74,562 (8.8%)
1947	1,366,498	35.5	125,921 (10.2%)	123,749	3.2	18,873 (18.0%)	1,031,335	26.8	106,560 (11.5%)
1948	1,532,664	35.5	166,166 (12.2%)	140,648	3.3	16,899 (13.7%)	1,152,783	26.7	121,448 (11.8%)
1949	1,716,533	37.2	183,869 (12.0%)	160,855	3.5	20,207 (14.4%)	1,228,726	26.6	75,943 (6.6%)
1950	1,931,696	38.0	215,163 (12.5%)	157,611	3.1	−3,244 (2.0%)	1,333,755	26.2	105,029 (8.5%)
1951	2,165,010	38.3	233,314 (12.1%)	175,431	3.1	17,820 (11.3%)	1,462,262	25.9	128,507 (9.6%)
1952	2,400,889	39.1	235,879 (10.9%)	184,479	3.0	9,048 (5.2%)	1,584,219	25.8	121,957 (8.3%)
1953	2,657,983	39.1	257,094 (10.7%)	201,691	3.0	17,212 (9.3%)	1,748,892	25.7	164,673 (10.4%)
1954‡	2,910,000	40.0	252,017 (9.5%)	214,000	2.9	12,309 (6.1%)	1,887,000	25.0	138,108 (7.9%)

	Large Light & Power			Other Classifications			Total	
	Revenue	% Total	Annual Change	Revenue	% Total	Annual Change	Revenue	Annual Change
1938	518,694	24.1	−64,503 (11.1%)	164,335	7.6	723 (0.4%)	2,156,580	−4,217 (0.2%)
1939	572,659	25.0	53,965 (10.4%)	167,599	7.3	3,264 (2.0%)	2,289,583	133,003 (6.2%)
1940	631,428	25.9	58,769 (10.3%)	174,112	7.1	6,513 (3.9%)	2,440,217	150,634 (6.6%)
1941	758,083	28.5	126,655 (20.1%)	179,232	6.7	5,120 (2.9%)	2,665,057	224,840 (9.2%)
1942	828,318	29.0	70,235 (9.3%)	195,034	6.8	15,802 (8.8%)	2,855,843	190,786 (7.2%)
1943	964,192	31.3	135,874 (16.4%)	233,896	7.6	38,952 (20.0%)	3,077,643	221,800 (7.8%)
1944	1,043,392	31.8	79,200 (8.2%)	235,436	7.2	1,450 (6.2%)	3,276,751	199,108 (6.5%)
1945	1,001,957	30.0	−41,435 (4.0%)	231,647	6.9	−3,789 (1.6%)	3,341,518	64,767 (2.0%)
1946	969,349	28.0	−32,608 (3.3%)	219,983	6.4	−11,664 (5.0%)	3,459,560	118,042 (3.5%)
1947	1,106,555	28.7	137,206 (14.1%)	224,628	5.8	4,645 (2.1%)	3,852,765	393,205 (11.4%)
1948	1,250,684	29.0	144,129 (13.0%)	236,534	5.5	11,906 (5.3%)	4,313,313	460,548 (12.0%)
1949	1,262,698	27.4	12,014 (1.0%)	245,257	5.3	8,723 (3.7%)	4,614,069	300,756 (7.0%)
1950	1,404,980	27.6	142,282 (11.3%)	258,423	5.1	13,166 (5.4%)	5,086,465	472,396 (10.2%)
1951	1,571,932	27.8	166,952 (11.9%)	273,037	4.8	16,614 (6.4%)	5,647,672	561,207 (11.0%)
1952	1,684,073	27.4	112,141 (7.1%)	283,612	4.6	10,575 (3.9%)	6,137,272	489,600 (8.7%)
1953	1,883,640	27.7	199,567 (11.9%)	301,454	4.4	17,842 (6.3%)	6,793,660	656,388 (10.7%)
1954	1,945,000	26.8	61,360 (3.3%)	314,000	4.3	12,546 (4.2%)	7,270,000	476,340 (7.0%)

Source: Edison Electric Institute. * Revenue from sales under distinctly rural rates. ‡ Estimated.

Use by the Average Residential Customer—Kwhr



Source: Edison Electric Institute, 1954 estimated. All bars from left to right: 1944, 1953, 1954

The rise in the rate of residential kwhr usage seemed even more remarkable than ever in 1954. In spite of the decline in employment, average customer usage increased by almost 200 kwhr to a figure of 2,540 kwhr at the close. For this amount of electricity the average consumer paid at a rate of 2.69¢ per kwhr, about 2% less than last year and had an average bill of $68 annually.

Average Use and Bill Per Customer

	Residential				Small Light and Power			
	Average Use		Average Bill		Average Use		Average Bill	
	Kwhr	Change	per Kwhr	Annual	Kwhr	Change	per Kwhr	Annual
1938	853	48 (6.0%)	4.14¢	$35.31	4,668	90 (2.0%)	3.30¢	$154
1939	897	44 (4.9%)	4.00¢	$35.88	4,968	300 (6.4%)	3.19¢	$158
1940	952	55 (6.1%)	3.84¢	$36.56	5,280	312 (6.3%)	3.08¢	$163
1941	986	34 (3.6%)	3.73¢	$36.78	5,754	474 (9.0%)	2.94¢	$169
1942	1,022	36 (3.7%)	3.67¢	$37.51	6,354	600 (10.4%)	2.82¢	$179
1943	1,070	48 (4.7%)	3.60¢	$38.52	6,722	368 (5.8%)	2.74¢	$184
1944	1,151	81 (7.6%)	3.51¢	$40.40	7,080	358 (5.3%)	2.74¢	$194
1945	1,229	78 (6.8%)	3.41¢	$41.97	7,062	−18 (0.3%)	2.79¢	$197
1946	1,329	100 (8.1%)	3.22¢	$42.79	7,224	162 (2.3%)	2.80¢	$202
1947	1,438	109 (8.2%)	3.09¢	$44.43	7,915	691 (9.6%)	2.69¢	$213
1948	1,563	125 (8.7%)	3.01¢	$47.05	8,535	620 (7.8%)	2.67¢	$228
1949	1,684	121 (7.7%)	2.96¢	$49.68	8,871	336 (3.9%)	2.66¢	$236
1950	1,830	146 (8.7%)	2.88¢	$52.70	9,320	449 (5.1%)	2.64¢	$246
1951	2,004	174 (9.5%)	2.81¢	$56.31	10,432	1,112 (11.9%)	2.55¢	$266
1952	2,169	165 (8.2%)	2.77¢	$60.08	11,106	674 (6.5%)	2.55¢	$283
1953	2,345	176 (8.1%)	2.74¢	$64.25	12,018	912 (8.2%)	2.52¢	$303
1954*	2,540	195 (8.3%)	2.69¢	$68.33	12,625	607 (5.1%)	2.53¢	$318

Source: Edison Electric Institute. * Estimated.

Source: Edison Electric Institute. * Estimated.

Total Ultimate Customers

	Average Use		Average Bill	
	Kwhr	Change	per Kwhr	Annual
1938	3,392	−319 (8.4%)	2.36¢	$78.02
1939	3,702	310 (9.1%)	2.16¢	$79.96
1940	3,998	296 (8.0%)	2.06¢	$82.35
1941	3,535	537 (13.4%)	1.90¢	$86.17
1942	4,980	445 (9.8%)	1.79¢	$89.14
1943	5,753	773 (15.5%)	1.66¢	$95.50
1944	6,047	294 (5.1%)	1.65¢	$99.78
1945	5,762	−285 (4.7%)	1.73¢	$99.63
1946	5,422	−340 (5.9%)	1.81¢	$98.14
1947	5,828	406 (7.5%)	1.77¢	$103.16
1948	6,073	245 (4.2%)	1.79¢	$108.71
1949	5,937	−136 (2.2%)	1.86¢	$110.43
1950	6,377	440 (7.4%)	1.81¢	$115.42
1951	6,922	545 (8.5%)	1.78¢	$123.21
1952	7,183	261 (3.8%)	1.79¢	$128.58
1953	7,815	632 (8.8%)	1.77¢	$138.33
1954*	8,100	285 (3.6%)	1.78¢	$144.18

Source: Edison Electric Institute. * Estimated

Small light and power customers increased their usage by about 600 kwhr during the year, bringing average use up past 12½ thousand kwhr. Rates in 1954 remained level with those of 1953 at about 2½¢ per kwhr.

The average of all power consumed per customer went above 8,000 with a total of 8,100 kwhr recorded at year-end. Average rate amounted to 1.8¢ per kwhr.

Financial

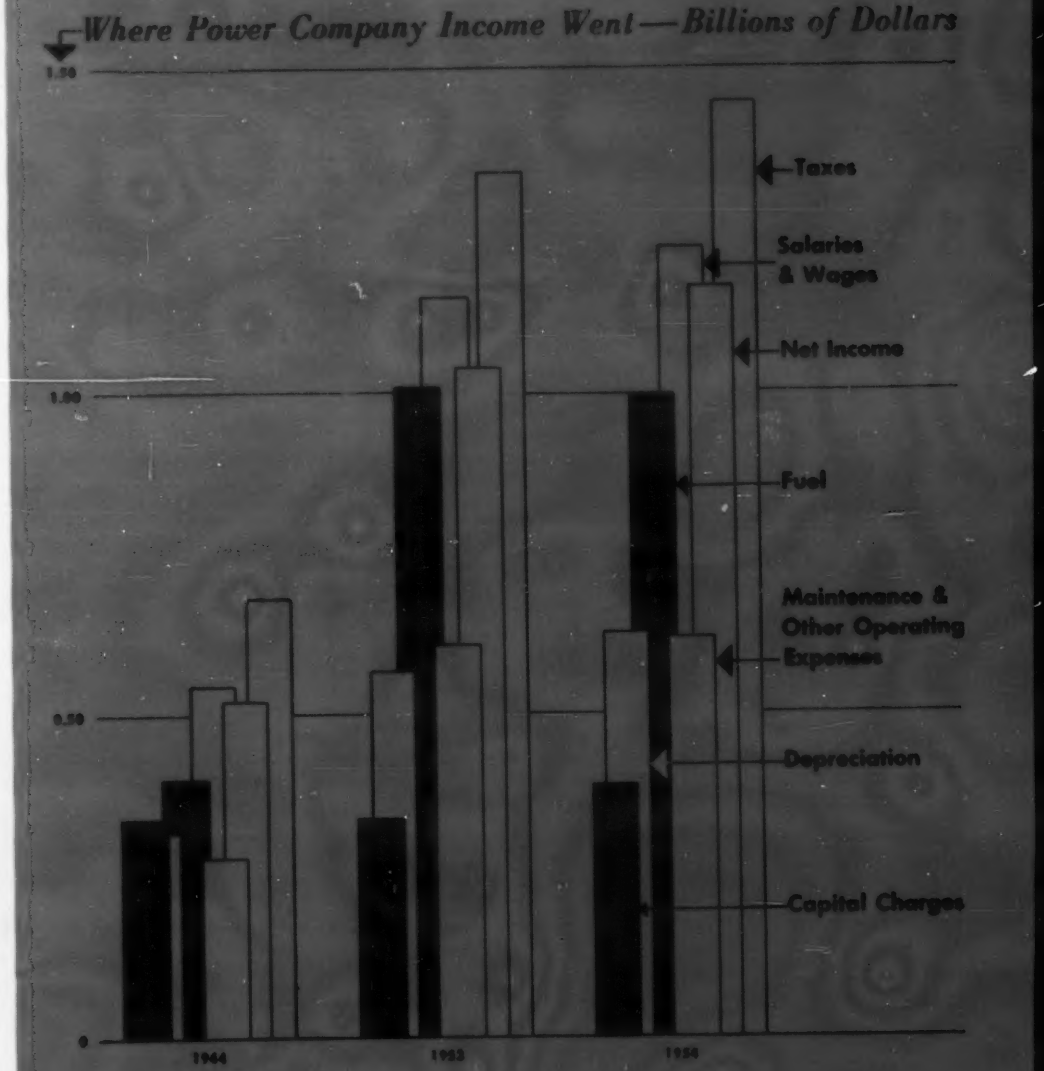
REVENUES, TAXES HIT RECORD HIGH

Many new highs were established in the financial field by investor-owned electric companies in 1954. The more important are:

- Operating revenues hit $6.3 billion.
- Taxes continued to be largest expense, reaching $1,447 million or 23¢ out of every electric revenue dollar received.
- Net income went to $1,165 million.
- Common stock dividends totaled $717 million.
- Total assets reached $29.1 billion.
- Gross utility plant amounted to $31.5 billion.
- Total financing totaled over $2.3 billion.
- Preferred and common stock financing came to $784 million.

Operating revenues of investor-owned electric companies totaled a record $6.3 billion in 1954. Rate boosts and increased business helped all classifications to register gains for the year. The largest was in residential service which went up 10% over 1953. Large light and power showed an increase of 3% for its smallest gain since 1949 when only a 1% increase was recorded over 1948.

While operating revenues jumped 6.1% over 1953,



operating expenses went up only 1.6%. This indicates that the operating efficiency of the industry has been increased by the new plants and units coming on the lines. Base load operation of these new plants cut back operating hours of older, less efficient plants. It is interesting to note that the operating ratio of the industry turned downwards in 1954. It amounted to 45.1% as compared with 47.2% in 1953 and is the lowest since 1946 when it stood at 44.4%.

Fuel was the third largest expense in the statement of income and took 15.8¢ of every revenue dollar. This expense amounted to $995 million as compared with $1,014 million, a record high established in 1953. The fuel bill in 1944 totaled only $404 million. The decrease in 1954 fuel expenses was due largely to the use of less expensive natural gas under the boilers in the steam plants. While coal consumption increased only 1.5% and oil decreased 20%, the use of natural gas in 1954 was up 14% over 1953. Another factor was that coal consumption in fuel-burning stations amounted to an average of 0.99 lb per kwhr in 1954 compared with 1.06 lb in 1953. Salaries and wages continued to be the second largest expense, $1,226 million, totaling 19.4¢ for every revenue dollar received.

Depreciation charges totaled $630 million, another record. This is almost twice such charges in 1944 when they were $319 million. The increased gross utility plant account going from $14.8 billion in 1944 to $31.5 billion in 1954 has been a principal factor in the depreciation expense increasing so rapidly.

Taxes for the fifth straight year was the largest expense in the statement of the income. For 1954 they set a record amounting to $1,447 million. The tax figures for these two years include deferred income taxes due to accelerated amortization of emergency facilities. For 1954 there is $51 million included, 1953, $29 million.

Gross corporate income amounted to $1,550 million

Composite Year End Balance Sheet

Class A & B Electric Utility Companies

	1954*	1953	1952	1944
Assets				
Electric Plant and Adjustments	23,300	25,397	22,967	11,895
Other Utility Plant and Adjustments	3,200	3,049	2,764	1,799
Unclassified and Undistributed				1,060
Total Utility Plant	31,500	28,646	25,731	14,754
Reserves for Depreciation and Amortization of Utility Plant	5,950	5,499	5,105	2,822
Total Utility Plant Less Reserves	25,550	23,147	20,626	11,932
Investment and Fund Accounts	900	912	1,255	1,297
Current and Accrued Assets	2,400	2,377	2,443	1,654
Deferred Debits	175	179	179	297
Capital Stock Discount and Expenses	75	56	49	38
Reacquired Securities	25	27	29	57
Total Assets	29,125	26,698	24,581	15,275
Liabilities				
Capital Stock				
Preferred	3,350	3,084	2,897	2,147
Common	6,600	6,226	5,867	4,124
Premium on Capital Stock	900	605	465	109
Total Capital Stock	10,850	9,915	9,229	6,380
Long Term Debt				
Bonds	12,800	11,630	10,369	5,993
Other	360	410	440	404
Total Long Term Debt	13,160	12,040	10,809	6,397
Current and Accrued Liabilities	2,300	2,228	2,090	960
Reserves (except those deducted above)	110	93	79	280
Deferred Credits	135	132	128	99
Contributions in Aid of Construction	100	87	78	85
Surplus				
Earned	2,170	1,868	1,643	866
Capital	300	335	525	238
Total Surplus	2,470	2,203	2,168	1,104
Total Liabilities	29,125	26,698	24,581	15,275
Balance Sheet Ratios				
Reserve for Depreciation Percent of Utility Plant	18.9	19.2	19.8	19.1
Current Assets Times Current Liabilities	1.04	1.07	1.17	1.72
Long Term Debt				
Percent of Gross Utility Plant	41.8	42.0	42.0	43.4
Percent of Net Utility Plant	51.5	52.0	52.4	53.6

Source: Federal Power Commission *1954 estimated by "Electrical World"

Financial Continued

in 1954 as against $1,384 million 1953 and only $859 million in 1944. Other income advanced to $167 million as related operations of the utilities, ie, gas, water, and steam departments were better than 1953. Another factor was that the Class A & B companes are getting a better return on the securities held in their investment accounts.

Capital charges continued its upward move, reaching a record $385 million in 1954. Interest on funded debt showed the largest increase as the industry sold $1.2 billion of "new" bonds and debentures. Of this total a little over $1 billion was sold publicly, and $150 million was sold privately to institutional investors.

Net income went to $1,165 million in 1954 versus a former high of $1,041 million in 1953. This is an increase of $124 million, or 12%.

Preferred and common stock dividends also hit a new high, totaling $863 million as compared with $788 million in 1953. Preferred stock dividends in 1954 accounted for only $146 million and common stock dividends, $717 million. These latter dividends have been increasing at a fast clip because of companies paying extras or raising their dividend payments during 1954 on an increased number of shares outstanding.

The income transferred to surplus amounted to $302 million as compared with $253 million in 1953. This was over two and half times the amount that was transferred in 1944.

Total estimated assets of Class A & B electric companies reporting to the Federal Power Commission amounted to a record $29.1 billion in 1954, nearly twice that reported in 1944. Gross utility plant totaled $31.5 billion in 1954 as compared with $14.8 billion in 1944. Total earned surplus came to $2,170 million in 1954 versus $1,868 million in 1953 and only $866 million in 1944.

Electric company financing as prepared by the Irving Trust Co showed that the industry sold over $2.3 billion of securities in 1954. This exceeded the former record

Power Companies Income Statement—Millions of Dollars

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954*
Total Electric Revenue	2,955	3,012	3,127	3,430	3,886	4,113	4,510	5,005	5,426	5,940	6,305
Operating Expenses	1,225	1,259	1,385	1,701	2,019	2,030	2,158	2,400	2,577	2,801	2,845
Depreciation	319	322	324	339	364	389	438	475	513	565	630
Total Expenses	1,544	1,581	1,709	2,040	2,383	2,419	2,596	2,875	3,090	3,366	3,475
Electric Operating Income before Taxes	1,411	1,431	1,418	1,440	1,503	1,694	1,914	2,130	2,336	2,574	2,830
Taxes	677	652	644	664	712	794	948	1,150	1,226	1,339†	1,447†
Electric Operating Income after Taxes	734	779	774	776	791	900	966	980	1,112	1,235	1,383
Other Income[1]	125	126	130	125	118	132	147	154	166	149	167
Gross Corporate Income	859	905	904	901	909	1,032	1,113	1,134	1,278	1,384	1,550
Capital Charges[2]	342	360	258	245	243	267	282	311	322	343	385
Net Income	517	545	646	656	666	765	831	823	956	1,041	1,165
Dividends	406	415	466	500	499	566	626	658	732	788	863
Surplus	111	130	180	156	167	199	205	165	224	253	302

Source: Federal Power Commission & Edison Electric Institute. * Estimated. [1] Includes revenues of gas, water, and steam departments and interest on securities held. [2] Includes amortization and interest on long term debt. † Includes Federal Income Tax deferment arising from amortization of emergency facilities of $51 million in 1954 and $29 million in 1953.

Security Sales by Electric Companies—Thousands of Dollars

	Bonds, Debentures, etc.		Stocks, Common and Preferred		Distribution of Security Sales		
	Public Investors	Institutional Investors		Total Financing	New Capital	Refunding	Total Issues
1938	750,549	192,762	20,694	964,005	123,056	840,949	964,005
1939	620,205	252,625	123,517	996,347	16,219	980,128	996,347
1940	660,716	188,976	139,767	989,459	92,376	897,083	989,459
1941	368,712	255,912	116,208	740,832	97,065	643,767	740,832
1942	226,800	99,688	29,766	356,254	92,666	263,588	356,254
1943	329,300	26,850	14,912	371,062	9,921	361,141	371,062
1944	851,743	103,950	62,535	1,018,228	15,587	1,002,641	1,018,228
1945	1,113,603	121,051	127,268	1,361,922	39,699	1,322,253	1,361,922
1946	633,966	64,040	384,441	1,082,447	172,846	909,601	1,082,447
1947	1,039,517	153,159	384,699	1,577,375	567,729	1,009,646	1,577,375
1948	996,641	156,525	297,460	1,450,626	1,314,456	136,170	1,450,626
1949	959,978	192,280	640,953	1,793,211	1,444,826	348,385	1,793,211
1950	838,108	278,389	591,340	1,707,837	1,300,040	407,797	1,707,837
1951	778,308	110,696	552,943	1,441,947	1,432,257	9,690	1,441,947
1952	929,167	145,860	630,652	1,705,679	1,693,514	12,165	1,705,679
1953	973,075	217,022	766,594	1,956,691	1,938,815	17,876	1,956,691
1954	1,379,885	184,063	784,469	2,348,417	1,761,154	587,263	2,348,417

Source: Irving Trust Co

of $1,956 million sold in 1953. Of the $2.3 billion sold, $1.8 billion was for "new money" as compared with a record $1.9 billion in 1953. The balance $587 million was for "refunding" of higher interest-bearing securities, enabling the industry to have its best year in this field since 1947 when a little over $1 billion of securities was refunded. The record year was 1945 when over $1.3 billion was refunded by the industry. The sale of preferred and common stocks hit a peak of over $784 million in 1954 as compared with the former high of $766 million established in 1953.

All yields on electric company securities as reported by Reis & Chandler, Inc, dropped in 1954 with the second quality common stocks leading the way. They went down from 5.57% at the end of 1953 to 4.75% at the end of 1954, a decrease of .82%, or 15%. First, second, and third quality bond yields held rather steady during 1954 with fluctuations varying from 0.18% to 0.24%. Likewise the three qualities of preferred stocks varied very little in 1954. They ran between 0.24% for the first quality to 0.28% for the second quality; third quality varied only 0.25% during the year. Common stock yields showed the biggest variation ranging from 0.45% for the third quality to 0.82% on the second quality, and 0.73% for the first quality.

Distribution of the Electric Revenue Dollar—Percent

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954*
Fuel	13.7	12.7	13.7	17.2	20.0	17.2	16.8	17.2	16.9	17.1	15.8
Salaries and Wages	17.4	18.1	20.2	21.2	21.2	21.1	20.7	20.5	20.0	19.6	19.4
Maintenance and Other Operating Expenses	10.4	11.0	10.5	10.5	10.8	11.1	10.4	10.3	10.5	10.5	9.9
Operating Ratio	41.5	41.8	44.4	48.9	52.0	49.4	47.9	48.0	47.4	47.2	45.1
Depreciation	10.8	10.7	10.4	9.7	9.4	9.5	9.7	9.5	9.5	9.5	10.0
Taxes	22.9	21.6	20.6	19.1	18.3	19.3	21.0	23.0	22.6	22.5	23.0
Electric Operating Income Before Taxes	47.7	47.5	45.4	41.4	38.7	41.2	42.4	42.6	43.1	43.3	44.9
After Taxes	24.8	25.9	24.8	22.3	20.4	21.9	21.4	19.6	20.5	20.8	21.9

Source: Edison Electric Institute * Estimated

Yields on Electric Utility Operating Company Securities

	Bonds			Preferred Stocks			Common Stocks		
Quarter	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality
1949									
I	2.70	2.78	2.92	4.00	4.27	4.67	5.78	6.69	8.03
II	2.69	2.75	2.88	3.98	4.26	4.66	5.94	6.96	8.14
III	2.61	2.65	2.77	3.88	4.15	4.54	5.55	6.47	7.51
IV	2.59	2.61	2.72	3.85	4.06	4.46	5.37	6.15	7.01
1950									
I	2.59	2.61	2.71	3.78	4.01	4.36	5.22	5.85	6.67
II	2.63	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50
III	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.75
IV	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
1951									
I	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.16
II	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
III	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
IV	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
1952									
I	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
II	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
III	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
IV	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
1953									
I	3.15	3.23	3.39	4.16	4.41	4.66	4.95	5.24	5.50
II	3.34	3.46	3.64	4.47	4.79	4.88	5.52	5.93	6.10
III	3.30	3.33	3.54	4.35	4.52	4.83	5.36	5.97	6.01
IV	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.37	5.51
1954									
I	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
II	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
III	2.88	2.90	3.10	3.89	3.99	4.38	4.50	4.80	5.19
IV	2.89	2.92	3.10	3.93	4.04	4.37	4.34	4.75	5.16

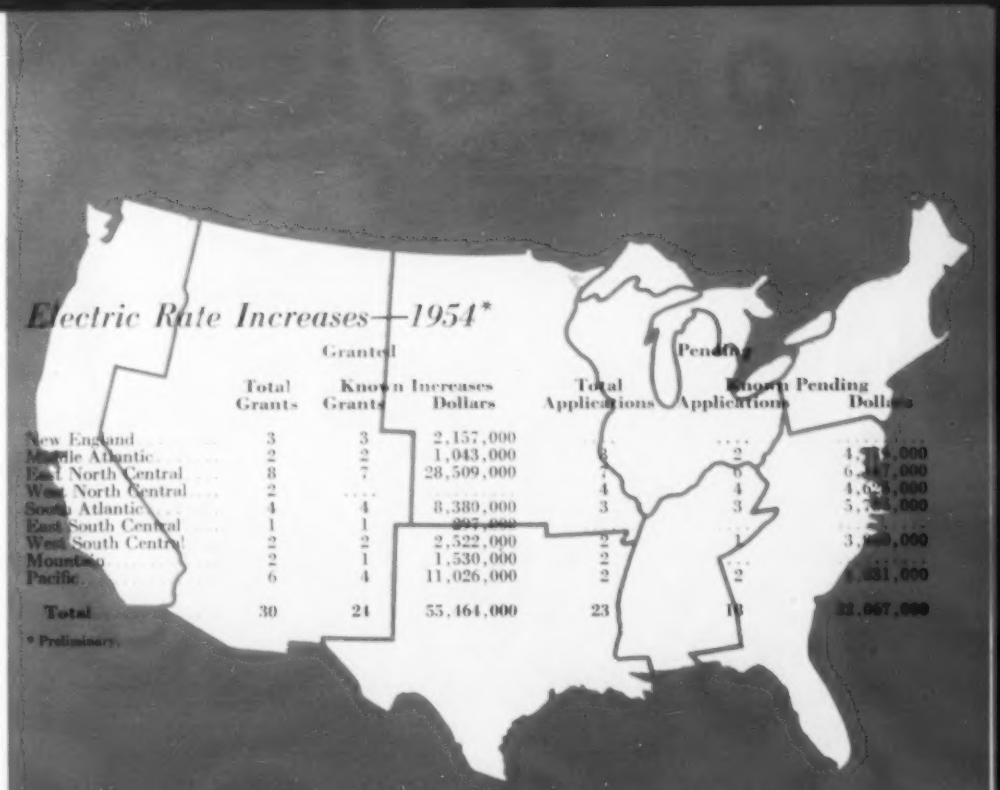
Source: Reis & Chandler, Inc.

Regulation

RATE INCREASES TURN UPWARDS

Although electric companies were granted 30 increases in 1954 as compared with 43 in 1953, the known dollar increases for 24 of these totaled over $55 million versus 27 of only $21 million in 1953. The largest increase was received by the Commonwealth Edison Co, amounting to $17.5 million, followed by Southern California Edison Co with $9,835,000. Rate increases for 1954 took second place, being exceeded only by 1952 when the industry received a record $76.7 million.

The number of rate applications pending totaled 23 on Dec. 31, 1954, the smallest number since 1950 when there were 21. The known dollars pending in 18 of those applications amounted to $32,067,000 as compared with 14 in 1950 with $20,200,000.



*Electric Rate Increases—1954**

	Granted			Pending		
	Total Grants	Known Increases Grants	Known Increases Dollars	Total Applications	Known Pending Applications	Known Pending Dollars
New England	3	3	2,157,000		....	....
Middle Atlantic	2	2	1,043,000	3	2	4,[illegible],000
East North Central	8	7	28,509,000	7	6	6,[illegible],000
West North Central	2	....	....	4	4	4,[illegible],000
South Atlantic	4	4	8,380,000	3	3	5,[illegible],000
East South Central	1	1	297,000	....	....	....
West South Central	2	2	2,522,000	1	1	3,[illegible],000
Mountain	2	1	1,530,000	2	....	....
Pacific	6	4	11,026,000	2	2	[illegible],000
Total	30	24	55,464,000	23	18	32,067,000

* Preliminary.

Electric Rate Increases

	Granted				Pending		
	Number of Grants	Known Increases Grants	Known Increases Dollars	As of December 31	Number of Applications	Known Pending Applications	Known Pending Dollars
1948	81	45	39,000,000	1948	18	11	22,000,000
1949	74	44	35,000,000	1949	7	5	16,000,000
1950	19	10	14,000,000	1950	21	14	20,200,000
1951	44	27	32,900,000	1951	44	32	75,700,000
1952	78	57	76,700,000	1952	36	21	44,400,000
1953	43	27	21,[illegible],000	1953	27	22	62,700,000
1954*	30	24	55,464,000	1954*	23	18	32,067,000

* Preliminary.

Labor

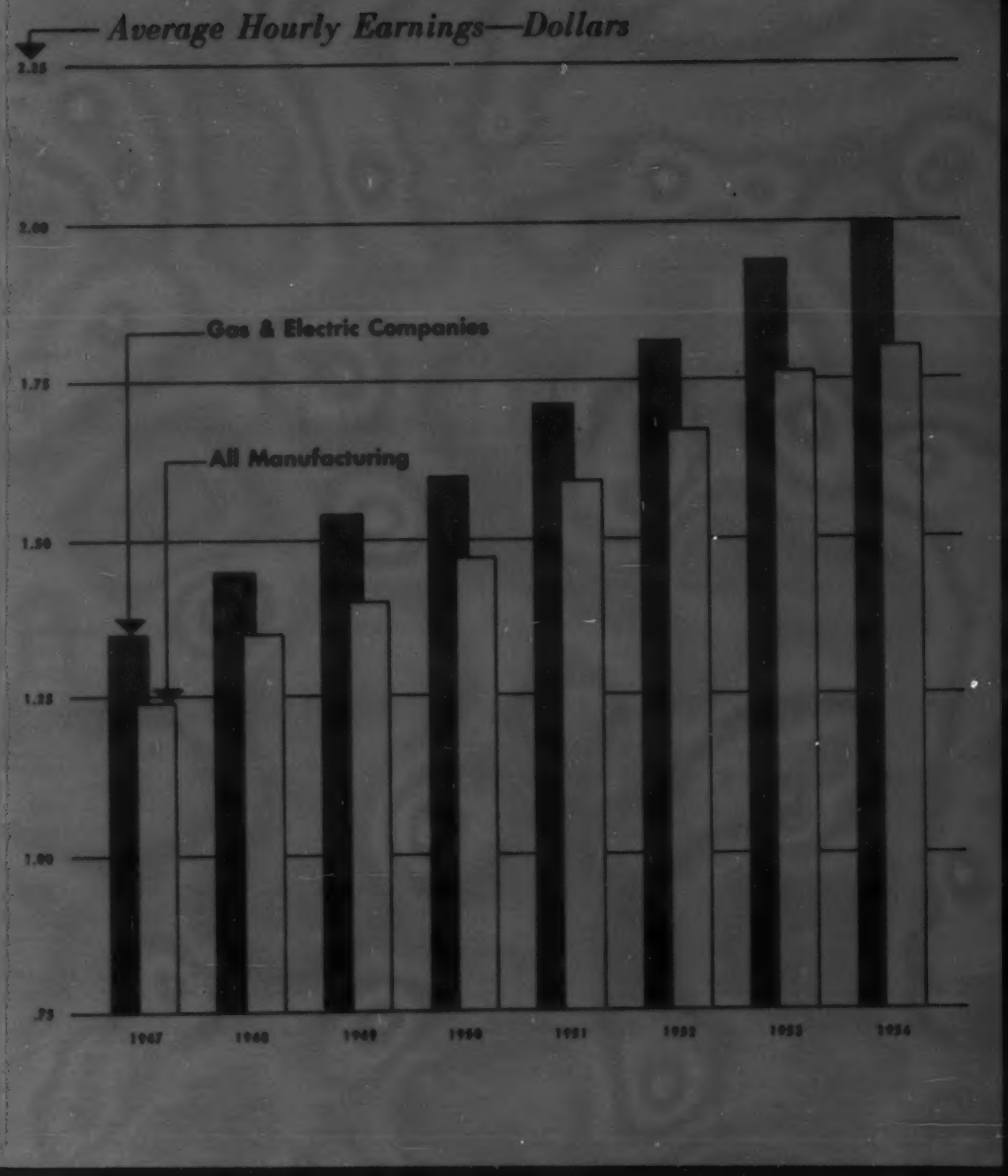
Wages Continue Up

Salaries and wages and employment in companies having electric, gas, and/or combination of both operations, continued to set a record in 1954. Workers in these companies received an estimated $2 an hour in 1954, an increase of 65¢ or 49% since 1947. The average pay for the utility employee is still some 10% above what the average worker in the manufacturing industry received in 1954.

Average Wages of Utility Employees†

	Hourly Earnings	Weekly Earnings	Weekly Hours	Number of Employees
1947	$1.35	$56.69	41.9	469.5
1948	$1.45	$60.74	41.8	498.0
1949	$1.54	$63.99	41.5	514.9
1950	$1.60	$66.60	41.6	526.0
1951	$1.71	$71.65	41.9	533.3
1952	$1.81	$75.12	41.5	543.3
1953	$1.94	$80.51	41.5	554.2
1954*	$2.00	$82.73	41.3	560.3

Source: Bureau of Labor Statistics. * Estimated. † Covers electric, gas and combination companies.



Generating Capacity—Kw and % Total U. S.

Source: Federal Power Commission. Data for 1954 as of November 1. All bars from left to right: 1944, 1953, 1954

Installation of the industry's 100 millionth kw of capacity sometime last October marked one of the stellar events of the year for the utilities. By the end of the year that figure was expected to be upped by 2 more million for an 11½% increase over 1953—one of the largest increases on record.

Fuel additions continue to provide the bulk of capacity growth as 9.4 million kw were added during the year. Fuel now represents over 77% of the total capacity, and as a percent of capacity added, fuel is well ahead of hydro with almost 90%.

Power companies and municipals held 86% of the nation's capacity at year-end, a slight decline, while federal agencies and cooperatives both gained a bit percentagewise. Cooperatives added almost 200 thousand kw during the last year for a big 23% increase in total capacity.

Installed Capacity by Type of Prime Mover—Mw

	Fuel			Hydro			Total	
	Capacity	% Total	Annual Change	Capacity	% Total	Annual Change	Capacity	Annual Change
1938	26,835	71.6	1,391 (5.5%)	10,657	28.4	481 (4.7%)	37,492	1,872 (5.3%)
1939	27,859	71.7	1,024 (3.8%)	11,004	28.3	347 (3.3%)	38,863	1,371 (3.7%)
1940	28,703	71.9	844 (3.0%)	11,224	28.1	220 (2.0%)	39,927	1,064 (2.7%)
1941	30,588	72.1	1,885 (6.6%)	11,817	27.9	593 (5.3%)	42,405	2,478 (6.2%)
1942	32,211	71.5	1,623 (5.3%)	12,842	28.5	1,025 (8.7%)	45,053	2,648 (6.2%)
1943	34,068	71.0	1,857 (5.8%)	13,883	29.0	1,041 (8.1%)	47,951	2,898 (6.4%)
1944	34,603	70.3	535 (1.6%)	14,586	29.7	703 (5.1%)	49,189	1,238 (2.6%)
1945	35,199	70.2	596 (1.7%)	14,912	29.8	326 (2.2%)	50,111	922 (1.9%)
1946	35,468	70.5	269 (0.8%)	14,849	29.5	−63	50,317	206 (0.4%)
1947	37,351	71.4	1,883 (5.3%)	14,971	28.6	122 (0.8)%	52,322	2,005 (4.0%)
1948	40,908	72.3	3,557 (9.5%)	15,652	27.7	681 (4.5%)	56,560	4,238 (8.1%)
1949	46,446	73.6	5,538 (13.5%)	16,654	26.4	1,002 (6.4%)	63,100	6,540 (11.6%)
1950	51,244	74.4	4,798 (10.3%)	17,675	25.6	1,031 (6.1%)	68,919	5,819 (9.2%)
1951	56,907	75.1	5,663 (11.1%)	18,868	24.9	1,193 (6.7%)	75,775	6,856 (9.9%)
1952	61,807	75.1	4,900 (8.6%)	20,419	24.9	1,551 (8.2%)	82,226	6,451 (8.5%)
1953	69,457	75.9	7,650 (12.4%)	22,045	24.1	1,628 (8.0%)	91,502	9,276 (11.3%)
Nov. 1, 1954	77,049	77.0	....	22,959	23.0	....	100,007	....
1954†	78,825	77.3	9,368 (13.5%)	23,175	22.7	1,130 (5.1%)	102,000	10,498 (11.5%)

Source: Federal Power Commission. † Estimated by Electrical World.

Generating Capacity by Ownership—Mw

	Power Companies		Federal		Municipal, State and Power District		Cooperatives	
	Capacity	% Total	Capacity	% Total	Capacity	% Total	Capacity	% Total
1938	33,246	88.7	1,156	3.1	3,090‡	8.2	...	...
1939	33,908	87.3	1,650	4.2	3,305‡	8.5	...	...
1940	34,898	87.4	1,944	4.9	3,585‡	8.9	...	...
1941	36,041	85.0	2,371	5.6	3,993‡	9.4	...	...
1942	37,442	83.1	3,216	7.1	4,395‡	9.8	...	...
1943	39,128	81.6	4,322	9.0	4,501‡	9.4	...	...
1944	39,733	80.8	4,886	9.9	4,570‡	9.3	...	...
1945	40,307	80.4	5,081	10.2	4,723‡	9.4	...	...
1946	40,535	80.2	4,929	9.8	5,052‡	10.0	...	...
1947	41,987	80.2	5,027	9.6	5,141	9.9	167	0.3
1948	45,381	80.2	5,556	9.8	5,453	9.6	200	0.4
1949	50,484	80.0	6,216	9.8	6,168	9.8	238	0.4
1950	55,175	80.1	6,921	10.0	6,511	9.4	312	0.5
1951	60,192	79.4	8,099	10.7	6,993	9.2	491	0.6
1952	64,349	78.4	9,678	11.8	7,671	9.3	528	0.6
1953	71,201	77.8	11,358	12.4	8,265‡	9.0	678‡	0.7
Nov. 1, 1953	77,160	77.2	13,174	13.2	8,794‡	8.8	880‡	0.8

Source: Federal Power Commission. † Includes Cooperatives. 1940 and after excludes publicly owned transit systems. ‡ Estimated by Electrical World.

Number and Installed Capacity of Electric Utility Generating Plants — *Kilowatts—November 1, 1954*

	Maine	N. H.	Vt.	Mass.	R. I.	Conn.	New England	N. Y.	N. J.	Pa.	Middle Atlantic	Ohio	Ind.	Ill.	Mich.
Hydro Plants	57	66	57	30	9	35	262	346	3	30	379	5	16	10	171
Capacity	275,650	261,914	183,417	181,732	2,675	96,470	1,001,841	1,325,932	6,200	436,695	1,667,827	70,855	56,170	47,959	290,052
Steam Plants	9	6	8	31	5	14	73	64	16	62	122	64	37	69	53
Capacity	192,000	173,250	55,775	1,968,389	340,500	1,367,990	3,999,975	6,753,245	2,535,054	6,237,150	15,525,419	5,908,779	2,855,600	6,668,525	3,792,225
I C Plants	17	1	6	7	2	1	34	15	2	9	26	21	16	20	42
Capacity	26,201	2,040	11,745	24,507	5,547	2,690	77,140	45,312	2,962	17,205	65,399	61,202	45,713	76,618	126,500
Total Plants	83	48	71	70	16	50	313	395	21	81	307	90	67	109	166
Capacity	494,934	437,204	251,937	2,174,619	348,602	1,291,650	4,998,736	8,024,589	2,544,256	6,690,900	17,259,845	6,040,837	2,957,513	6,792,910	4,213,557
Utilities With Capacity	18	11	14	33	6	10	92	45	19	34	69	32	41	26	68

	Wis.	East North Central	Minn.	Iowa	Mo.	S. D.	N. D.	Neb.	Kans.	West North Central	Del.	Md.	D. C.	Va.	W. Va.
Hydro Plants	105	264	58	57	7	.....	7	30	5	114	.....	3	1	38	19
Capacity	260,005	627,482	142,771	140,358	196,975	.....	164,696	161,388	6,135	770,804	.....	271,325	3,000	209,672	100,080
Steam Plants	30	225	83	69	86	10	12	19	37	235	5	12	2	16	17
Capacity	1,816,075	20,490,688	1,191,942	1,135,991	1,392,365	218,940	142,750	505,915	957,100	5,645,103	143,150	1,488,000	520,000	1,344,620	2,020,645
I C Plants	49	149	45	111	23	17	10	90	90	339	2	6	.....	16	7
Capacity	54,754	243,327	176,062	242,309	133,032	44,312	69,950	102,635	156,733	924,113	7,750	13,795	.....	29,457	2,995
Total Plants	196	639	186	237	116	45	69	139	132	678	7	23	3	60	34
Capacity	2,230,835	21,461,796	1,511,677	1,519,551	1,649,470	263,252	377,196	786,938	1,119,018	7,135,209	150,948	1,370,117	523,000	1,773,949	2,193,541
Utilities With Capacity	64	275	60	65	73	15	35	75	85	457	5	11	2	25	11

	N. C.	S. C.	Ga.	Fla.	South Atlantic	Ky.	Tenn.	Ala.	Miss.	East South Central	Ark.	La.	Okla.	Texas	West South Central
Hydro Plants	51	27	32	4	161	5	23	12	.....	40	7	.....	5	24	36
Capacity	744,565	931,555	476,710	12,661	2,940,945	140,860	1,736,000	1,291,230	.....	3,860,090	313,500	.....	166,126	339,000	820,726
Steam Plants	29	10	11	24	227	23	10	8	10	49	12	16	22	61	111
Capacity	1,961,296	639,000	1,094,290	1,833,240	30,660,621	1,338,725	1,527,500	1,625,000	610,735	5,412,160	779,895	1,251,000	912,334	4,046,500	6,989,679
I C Plants	14	4	2	29	99	3	4	3	29	39	14	46	48	103	211
Capacity	27,873	2,014	2,250	89,796	177,085	8,272	4,612	2,800	13,952	29,736	29,915	85,657	82,100	191,693	389,365
Total Plants	83	41	45	77	278	29	37	23	39	129	33	62	75	188	358
Capacity	2,734,024	1,572,569	1,573,210	1,625,707	33,527,651	2,088,857	3,270,113	2,918,630	686,286	9,011,086	1,123,150	1,337,557	1,160,558	4,596,758	8,217,968
Utilities With Capacity	28	13	9	30	132	12	9	4	20	45	18	20	43	70	151

	Mont.	Idaho	Wyo.	Col.	N. M.	Ariz.	Utah	Nev.	Mountain	Wash.	Ore.	Cal.	Pacific	Total United States
Hydro Plants	19	42	10	28	4	13	60	9	198	40	33	127	220	1,992
Capacity	796,970	734,909	107,302	248,317	24,910	980,000	95,325	805,189	3,971,144	3,099,286	1,328,209	2,890,507	7,728,102	31,988,653
Steam Plants	4	.....	11	23	12	11	6	.....	67	8	12	31	51	1,051
Capacity	71,800	.....	74,320	562,393	269,072	617,950	227,800	.....	1,727,040	196,220	198,710	4,670,225	5,065,155	70,773,056
I C Plants	4	6	21	25	10	22	19	7	123	7	6	10	23	1,225
Capacity	2,534	4,207	12,505	24,633	69,277	67,356	30,781	10,908	222,317	4,106	5,507	44,664	54,279	2,272,334
Total Plants	27	48	50	77	34	46	85	16	388	55	71	169	294	3,668
Capacity	869,294	739,367	194,048	835,353	377,259	1,665,306	362,906	897,088	5,920,391	3,799,212	1,532,676	7,611,196	12,644,086	109,697,221
Utility With Capacity	9	11	21	37	17	15	25	7	143	39	16	30	85	1,439

Station Economics

COAL RATE DIPS TO ONE POUND

Increased efficiency in the techniques of power production by fuel brought down the coal rate to an even pound per kwhr in 1954. Of the total energy thermally produced, coal represented over 65%, roughly the same proportion as in 1953. Use of oil dropped 20% to 68 million bbl while gas use increased 118 billion cu ft to a total of 1,151 billion cu ft.

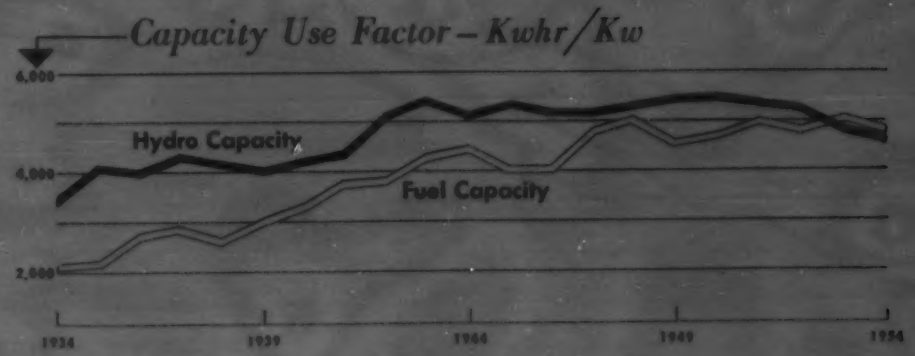
As a result of these variations, power generated from oil dropped 20% below last year representing only 9% of all power thermally produced. Power generated from gas increased 15% and accounted for the remaining 26% of power produced from fuels.

Hydro capacity use factor again showed a decline. The ratio of output per kw dropped 251 kwhr to 4,706 kwhr at year-end and for the second time on record fell below fuel use factor. However, there was a decline of 207 kwhr also in the fuel ratio, lowering that total to 4,934 kwhr per kw. The average use factor amounted to 4,881 kwhr per kw for the year, a decline of 215 kwhr from 5,096 kwhr per kw reported for 1953.

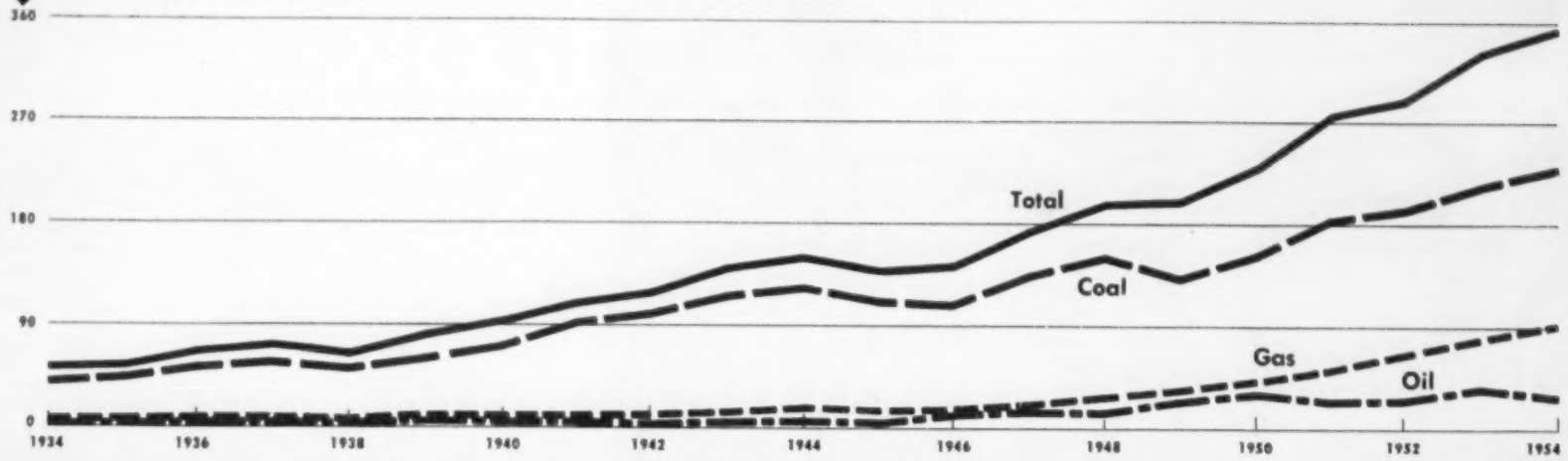
Production, Capacity, Average Use

	Production Millions of Kwhr			Year End Capacity Thousands of Kw			Kwhr per Kw of Average Capacity		
	Fuel	Hydro	Total	Fuel	Hydro	Total	Fuel	Hydro	Total
1938	69,533	44,279	113,812	26,835	10,657	37,492	2,661	4,251	3,113
1939	84,078	43,564	127,642	27,859	11,004	38,863	3,074	4,022	3,343
1940	94,516	47,321	141,837	28,703	11,224	39,927	3,342	4,258	3,600
1941	113,925	50,863	164,788	30,588	11,817	42,405	3,843	4,415	4,003
1942	122,109	63,871	185,979	32,211	12,842	45,053	3,889	5,186	4,253
1943	144,127	73,632	217,759	34,067	13,884	47,951	4,349	5,516	4,653
1944	154,244	73,945	228,189	34,603	14,586	49,189	4,492	5,195	4,698
1945	142,516	79,970	222,486	35,199	14,912	50,111	4,078	5,422	4,481
1946	144,772	78,406	223,178	35,468	14,849	50,317	4,097	5,269	4,445
1947	177,313	78,426	255,739	37,351	14,971	52,322	4,870	5,260	4,983
1948	200,228	82,470	282,698	40,908	15,652	56,560	5,052	5,386	5,193
1949	201,351	89,748	291,099	46,446	16,654	63,100	4,610	5,561	4,865
1950	233,203	95,938	329,141	51,244	17,675	68,919	4,774	5,589	4,986
1951	270,922	99,751	370,673	56,907	18,868	75,775	5,010	5,460	5,123
1952	294,121	105,102	399,224	61,807	20,419	82,226	4,955	5,350	5,054
1953	337,431	105,233	442,665	69,457	22,045	91,502	5,141	4,957	5,096
1954	365,819	106,396	472,215	78,825	23,175	102,000	4,934	4,706	4,881

Source: Federal Power Commission. * Estimated. 1945 and after excludes former Mining and Manufacturing and Railroad and Railway classifications.



Energy Generated from Fuel—Billions of Kwhr



Consumption of Coal, Oil and Gas

	Energy Generated From Coal, Oil, and Gas				Coal, Oil, and Gas Consumed				Coal Rate
	Coal Billions of Kwhr	Oil Billions of Kwhr	Gas Billions of Kwhr	Total Billions of Kwhr	Coal Millions of Tons	Oil Millions of Bbls	Gas Billions of Cu Ft	Coal and Equivalent of Oil and Gas Millions of Tons	Pounds per Kwhr
1939	64.7	7.3	11.6	83.6	44.54	17.14	188.88	57.60	1.38
1940	76.8	6.2	10.9	94.0	51.47	16.33	180.10	62.94	1.34
1941	93.8	7.5	12.0	113.3	62.67	20.08	201.76	75.70	1.34
1942	101.9	5.6	14.1	121.6	66.26	15.24	235.21	79.68	1.30
1943	119.2	6.8	17.8	143.8	77.30	17.99	301.94	93.27	1.30
1944	124.1	8.1	21.6	153.9	80.06	20.86	358.78	99.25	1.29
1945	114.8	7.8	19.7	142.3	74.72	20.23	326.21	92.64	1.30
1946	111.7	14.1	18.8	144.6	72.20	36.32	306.94	93.47	1.29
1947	137.0	16.9	23.1	177.0	89.53	45.31	373.05	115.67	1.31
1948	152.9	16.8	30.1	199.8	99.59	42.64	478.10	130.12	1.30
1949	135.5	28.5	37.0	201.0	83.96	66.20	550.12	124.57	1.24
1950	154.5	33.7	44.6	232.8	91.87	75.42	628.92	138.42	1.19
1951	185.2	28.7	56.6	270.5	105.77	63.94	763.90	154.50	1.14
1952	195.4	29.7	68.5	293.6	107.07	67.22	910.12	160.87	1.12
1953	218.9	38.4	79.8	337.1	115.90	82.24	1,034.27	178.49	1.06
1954*	233.4‡	32.1‡	92.1‡	357.9†	116.89	67.81	1,151.46	179.02	1.09

Source: Federal Power Commission. * Twelve months ended November 1. † Small amount of energy generated from wood included in 1954. ‡ Preliminary.

Manufacturing

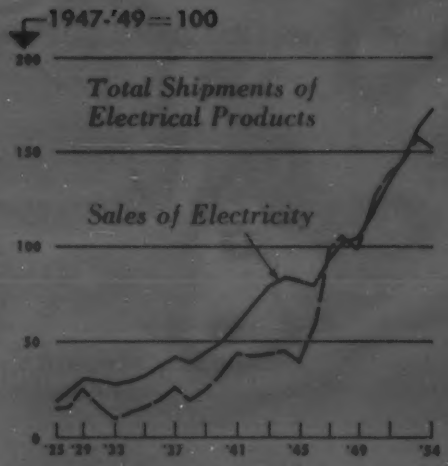
MANUFACTURING'S SECOND BEST YEAR

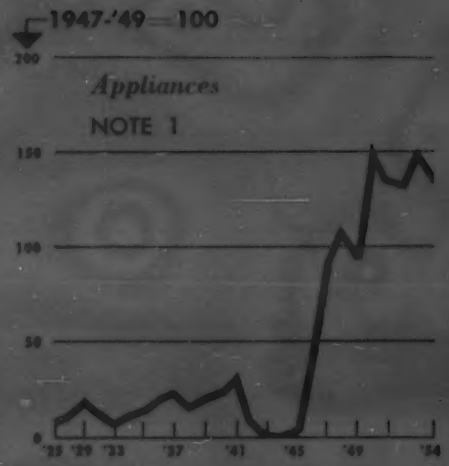
The declines in business activity that characterized 1954 also affected the electrical manufacturing industry—but not enough to prevent it from being the second best year it's ever had. Total volume of shipments fell $715 million below the record $16,310 million 1953 total, but were still 5% ahead of 1952.

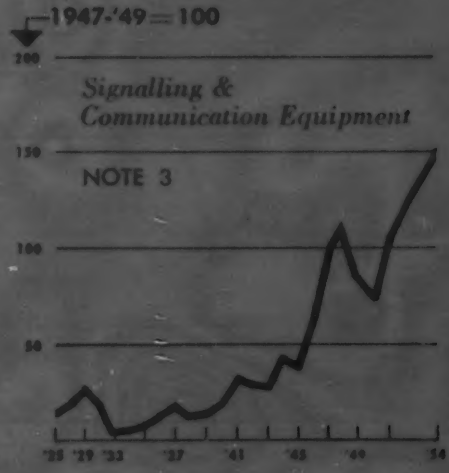
Most branches saw decreases in sales volume. Biggest drops were in electric appliances, industrial apparatus, and electrical insulating materials, all of which were off 10%. Electrical building equipment and supplies sales were down 8%, and insulated wire and cable dropped 5%. But in volume, these groups add up to over half the total.

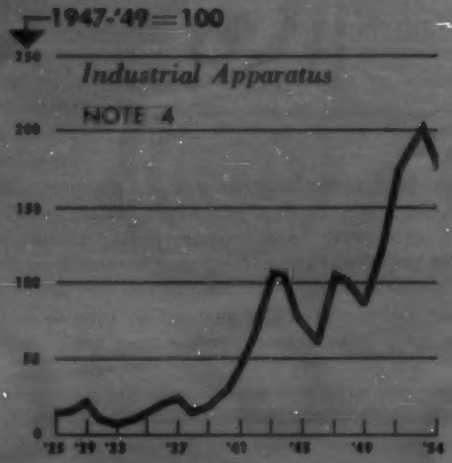
On the other hand, some branches did even better than ever in 1954. A jump of 10% was reported in sales of signalling and communication equipment while generating, transmission, and distribution equipment showed an increase of 3%. Illuminating equipment showed a slight gain of 1%. Volume of shipments in these three groups amounted to $3.6 billion, about 23% of the industry total.

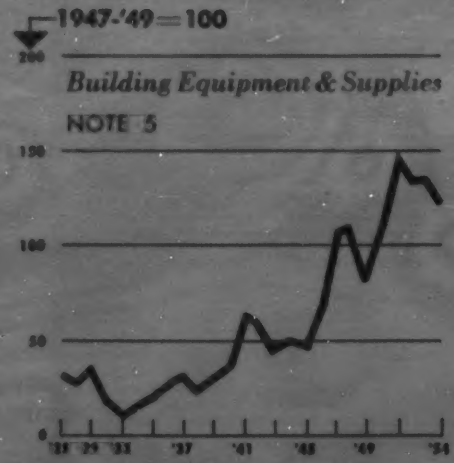
Corresponding to these dollar figures on total volume of shipments, indexes based on a 1947-1949 average showed the largest drop of 21.1 points in industrial apparatus (down to 183.4), and the biggest increases in signalling and communication equipment—up 13.2 points to 150.8.

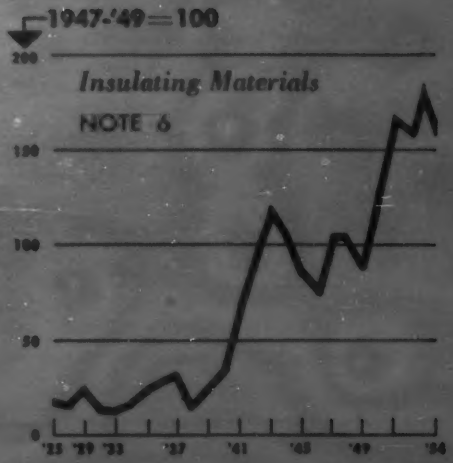


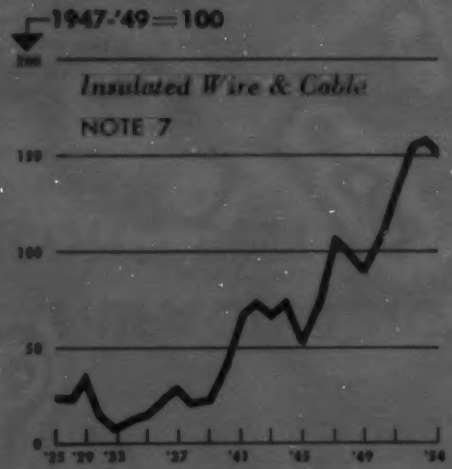


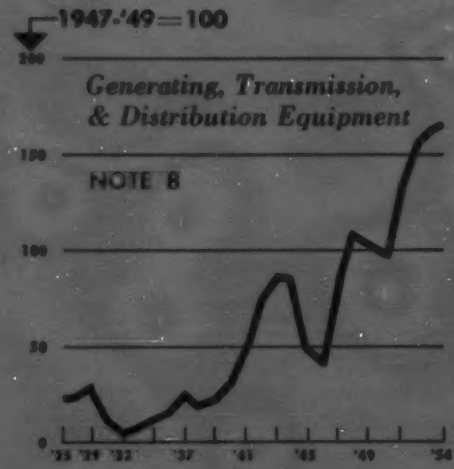


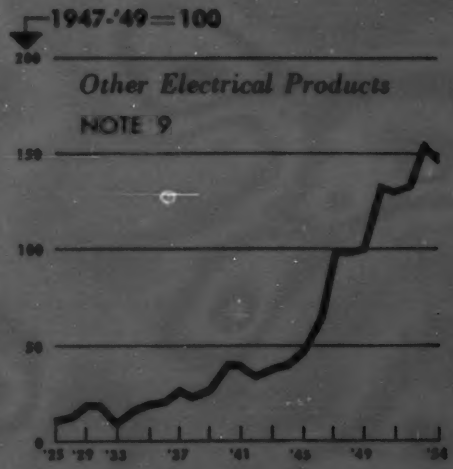

1947-'49=100
Industrial Apparatus
NOTE 4
200
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '54


1947-'49=100
Building Equipment & Supplies
NOTE 5
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '54


1947-'49=100
Insulating Materials
NOTE 6
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '54


1947-'49=100
Insulated Wire & Cable
NOTE 7
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '54


1947-'49=100
Generating, Transmission,
& Distribution Equipment
NOTE 8
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '54


1947-'49=100
Other Electrical Products
NOTE 9
150
100
50
0
'25 '29 '33 '37 '41 '45 '49 '54

TOTAL SHIPMENTS OF ELECTRICAL PRODUCTS 1925-1954 (REVISED)

SHIPMENTS IN MILLIONS OF DOLLARS, INDEXES BASED ON AVERAGE YEAR 1947-1949 = 100

	1		2		3		4		5		6		7		8		9		
	APPLIANCES	Index	ILLUMINATING EQUIPMENT	Index	SIGNAL AND COMMUNICATION EQUIPMENT	Index	INDUSTRIAL APPARATUS	Index	BUILDING EQUIPMENT AND SUPPLIES	Index	INSULATING MATERIALS	Index	INSULATED WIRE AND CABLE	Index	GENERATING, TRANSMISSION & DISTRIBUTION EQUIPMENT	Index	OTHER ELECTRICAL PRODUCTS	Index	TOTAL	Index
1925	272.4	9.9	62.6	13.4	167.0	15.3	173.7	15.1	108.0	30.3	29.7	29.0	210.6	28.4	254.3	23.5	139.9	12.1	1,537.4	18.2
1927	346.2	12.5	80.4	17.2	158.3	21.9	185.5	16.1	103.8	29.1	29.5	28.9	210.0	28.3	277.9	25.7	304.3	13.8	1,769.0	17.2
1929	689.8	22.2	129.3	27.6	201.1	28.7	264.3	23.0	134.7	37.7	42.2	28.4	312.6	37.6	324.5	30.0	578.1	20.7	2,596.6	25.3
1931	381.0	13.9	85.6	14.0	130.6	18.7	153.6	11.6	73.8	20.7	21.7	16.6	120.2	14.5	176.0	16.3	528.6	18.9	1,631.2	15.9
1933	265.6	9.7	36.5	7.8	27.6	3.9	99.6	7.8	47.0	13.2	20.6	13.9	75.0	9.0	66.2	6.1	341.5	12.2	969.6	9.4
1934	349.7	12.7	50.7	10.8	45.1	6.5	128.0	11.1	60.4	16.9	26.5	17.9	96.1	11.6	92.1	8.5	467.4	16.7	1,316.1	12.8
1935	435.8	15.8	70.9	15.1	55.7	8.0	161.3	14.0	73.3	20.5	34.9	23.5	122.2	14.7	134.0	12.4	597.9	21.4	1,686.1	16.4
1936	600.6	21.8	98.6	21.1	79.6	11.4	233.8	20.3	96.2	26.9	44.9	30.2	191.9	23.1	195.8	18.1	836.2	29.8	2,177.5	21.2
1937	647.0	23.5	106.8	22.8	137.9	19.7	286.9	25.0	115.0	32.2	49.2	33.1	246.3	29.8	301.5	27.9	781.6	28.0	2,671.2	26.0
1938	559.4	17.1	117.6	25.1	95.7	13.7	179.9	15.6	82.7	23.2	28.1	18.9	169.1	20.4	222.5	20.6	681.1	24.4	2,005.9	19.9
1939	607.5	22.1	113.2	24.2	114.5	16.4	225.9	19.9	108.7	30.4	41.5	27.9	204.4	24.6	247.9	22.9	787.3	28.2	2,455.8	23.8
1940	670.8	24.7	206.5	44.2	151.9	21.8	327.3	28.5	131.1	36.7	55.3	37.2	319.8	38.5	351.2	32.6	1,142.9	40.9	3,866.6	32.5
1941	923.1	33.5	302.3	64.9	240.3	34.4	578.4	50.3	227.1	63.5	102.1	68.7	548.9	66.2	564.3	50.3	1,104.1	39.5	4,500.6	44.4
1942	396.9	16.3	261.2	55.8	220.9	31.6	875.9	76.1	213.5	59.7	139.9	93.5	615.2	74.2	882.9	74.2	1,000.9	35.8	4,414.3	42.9
1943	54.3	2.9	129.2	25.7	214.2	30.7	1,366.7	108.4	172.4	48.3	180.2	121.2	563.9	68.0	986.0	89.3	1,048.8	37.5	4,566.0	44.4
1944	40.8	1.5	121.2	25.9	317.8	45.5	1,216.3	095.5	179.3	50.2	160.5	108.0	638.4	75.8	948.6	87.7	1,122.8	40.3	4,733.7	46.0
1945	146.0	5.2	187.1	40.0	283.3	40.6	869.8	75.6	176.6	49.3	127.7	86.0	445.7	53.8	546.7	50.5	1,328.5	47.8	4,110.2	39.9
1946	1,331.6	44.6	383.9	82.0	468.5	67.1	739.8	64.3	234.5	65.6	113.4	76.3	605.2	72.7	469.6	43.4	1,809.4	64.8	6,053.9	58.8
1947	2,520.6	91.6	460.8	98.4	702.6	100.6	1,294.5	107.3	378.1	105.8	154.6	104.1	895.1	107.9	911.5	84.2	2,780.4	99.5	10,048.2	97.7
1948	3,020.5	109.8	483.5	103.3	791.1	113.3	1,193.4	103.8	395.7	110.8	156.4	105.4	888.7	101.1	1,202.6	111.1	2,703.5	96.9	10,688.5	105.8
1949	2,721.2	98.5	459.6	98.2	599.9	85.9	1,029.9	88.7	297.9	83.4	134.2	90.4	752.8	99.8	1,132.3	104.6	2,830.9	101.3	9,948.9	98.7
1950	4,216.5	152.6	583.0	124.5	535.8	76.7	1,422.0	122.7	403.7	113.0	193.2	130.1	879.8	100.2	1,095.9	101.3	3,739.4	133.8	13,666.5	127.1
1951	3,791.2	137.2	667.6	142.6	731.7	104.8	1,985.6	172.7	533.7	149.4	248.9	167.8	1,097.1	132.4	1,437.3	132.8	3,675.4	131.6	14,168.3	131.7
1952	3,689.6	133.5	647.0	138.4	809.8	127.4	2,214.3	192.5	474.6	132.8	236.9	159.6	1,266.9	152.5	1,709.7	158.0	3,756.0	134.5	14,985.6	144.8
1953	4,185.2	150.3	670.3	143.3	961.1	137.6	2,251.2	204.5	678.2	189.9	274.1	184.7	1,216.5	158.1	1,789.1	164.5	4,239.7	155.0	16,310.6	158.7
1954	3,811.9	137.8	674.4	144.2	1,053.6	150.9	2,108.6	183.4	441.5	123.6	264.9	188.1	1,249.8	159.8	1,829.3	169.1	4,187.6	349.8	15,595.3	151.7

The data shown in this tabulation are based upon total industry shipments including exports and interplant transfers of electrical products which are considered to cover, not only those products included in the Electrical Machinery Group as defined by the U. S. Census of Manufactures, but also lighting fixtures, steam engines and turbines, household and commercial refrigeration machinery, air conditioning machinery, household laundry equipment, vacuum cleaners and electrical insulating materials such as porcelain, mica, laminated products, vulcanized fiber, varnished fabric and paper.

Non-Electrical Products, including non-electrical defense and war material, manufactured within the industry, have not been included in these data.

The product content of each of the nine branches of the electrical manufacturing industry is as follows:

1. *Appliances*, includes, electric household refrigerators, electric farm and home freezers, electric ranges, electric water heaters, electric housewares, electric fans, electric commercial cooking equipment, electric dehumidifiers, electric household food waste disposers and dishwashers, packaged room air conditioners, electric dryers, electric ironers, electric washing machines, vacuum cleaners, and radio and television receiving sets.

2. *Illuminating Equipment* includes, industrial, commercial and residential lighting equipment; aviation ground lighting, floodlighting and street lighting equipment; vehicular, railway and other lighting equipment; and portable lamps.

3. *Signalling and Communication Equipment* includes, signalling apparatus, telephone and telegraph equipment, and electric railway signals and attachments.

4. *Industrial Apparatus* includes, carbon products, commutators, electronic tubes, (except radio and cathode ray), welding wire, welding machines, resistance welders, industrial heating units and devices, industrial controls, induction and dielectric heating apparatus, mining belt conveyors, motors and generators (except large apparatus), mining and industrial electric locomotives, metallic rectifiers, and renewal parts for motors, generators and mining and industrial locomotives.

5. *Building Equipment and Supplies* includes, conduit fittings, metallic and plastic outlet and switch boxes, rigid steel conduit and electrical metallic tubing and fittings, wiring devices, molded case breakers, busways, fuses, switch and enclosed breakers, and panelboards and distribution boards.

6. *Electrical Insulating Materials* includes, standard and special dry process electrical porcelain, steatite electrical products, laminated products, manufactured electrical mica, varnished fabric and paper, varnished tubing and saturated sleeving, and vulcanized fiber.

7. *Insulated Wire and Cable* includes, rubber and thermoplastic power and control cable, asbestos insulated wire and cable, flexible cords, cord sets, fixture and appliance wire, magnet wire, paper power cable, building wire and cable, portable molded rubber sheathed cord and cable, varnished cambric cable, weatherproof and slow-burning wire, communication and signal wire and cable, and automotive, aircraft and marine wire and cable.

8. *Generation, Transmission, and Distribution Equipment* includes, power capacitors, electric measuring and test equipment transmission and distribution voltage regulators, hydraulic turbines, high voltage insulators, lightning protective devices, generating and converting apparatus, marine turbine-propulsion, overhead trolley line materials, switchgear, power and distribution transformers, load steam and gas turbines, pole line hardware, rail bonds, transmission hardware, and other related products.

9. *Other Electrical Products* includes, radio, electronic and television transmission and communication equipment, automatic temperature controls, specialty capacitors, specialty transformers, ballasts (fluorescent), time switches, X-ray tubes, X-ray apparatus, land transportation motors and controls, electric lamps, air conditioning and commercial refrigeration equipment, radio receiving-type tubes, cathode ray tubes, engine electrical equipment, phonographs, phonograph records, recording devices, storage batteries, primary batteries, electrical hearing aids, lamp components, Christmas tree lighting outfits, and other related products.

Source: National Electrical Manufacturers Association

Canada

The Canadian Electric Utility Industry

	Nfld. & P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon & N.W.T.	Total Canada
Electric Plant Construction—Thousands of Dollars											
Fuel 1964	888	1,220	100	0	2,200	700	3,502	1,100	1,200	0	11,211
1965	1,025	3,500	2,000	0	2,804	5,619	4,825	7,720	600	0	32,088
Hydro 1964	100	1,722	700	52,459	80,211	12,011	0	6,210	17,250	0	170,141
1965	65	1,750	5,000	57,144	71,010	3,011	0	2,506	18,150	0	157,703
Transmission 1964	257	1,252	611	38,396	62,199	3,781	2,503	3,123	8,658	0	80,860
1965	716	1,009	2,100	32,407	64,038	2,661	2,306	6,575	5,760	0	95,510
Distribution 1964	1,140	1,432	842	19,581	35,108	5,261	8,369	4,765	14,510	3	90,026
1965	1,686	2,121	612	14,535	35,342	4,959	9,370	5,024	15,470	2	89,451
Miscellaneous 1964	75	1,039	0	935	4,269	288	2,010	782	2,250	10	11,645
1965	177	804	0	1,359	5,588	293	2,280	504	1,729	5	11,729
Total 1964	2,550	6,735	2,253	98,351	164,087	22,108	16,393	16,038	43,975	13	372,503
1965	4,964	7,264	9,712	105,445	158,778	19,523	17,861	20,429	41,709	7	385,481
Maintenance—Thousands of Dollars											
1964	268	938	1,000	7,488	20,615	1,378	405	1,098	3,032	15	35,240
1965	276	852	1,000	7,786	32,344	1,650	450	1,264	3,371	15	49,010
Line & Substation Construction—Thousands of Dollars											
Transmission Line											
66 kv & up 1964	116	378	280	12,898	13,200	2,150	1,575	697	6,778	0	38,448
1965	146	0	1,400	18,122	18,000	604	1,000	1,022	2,509	0	44,004
22-66.9 kv 1964	168	71	0	1,688	4,511	284	638	350	875	0	7,911
1965	188	24	0	1,288	3,610	416	1,680	338	144	0	7,688
Underground†											
Transmission 1964	0	4	0	4,676	37	0	58	0	25	0	4,832
1965	275	0	0	0	2,118	0	58	0	54	0	3,497
Distribution 1964	0	642	4	1,339	1,164	154	25	623	649	3	4,564
1965	0	0	4	1,621	705	0	38	558	889	1	3,222
Primary Distribution Line											
Total 1964	679	705	685	4,295	25,608	3,794	4,591	3,234	3,259	0	44,299
1965	655	645	888	4,148	24,544	2,600	5,005	3,529	1,917	0	43,302
Rural 1964	38	753	888	1,288	22,211	1,888	4,054	1,648	106	0	32,346
1965	0	627	850	1,257	25,320	1,260	4,625	1,588	169	0	33,099
Substations 1964	278	101	221	8,647	28,305	1,479	542	1,746	2,473	0	44,811
1965	70	186	665	6,946	25,374	1,660	684	1,921	3,344	0	37,046
Line & Substation Construction											
Transmission Line—Circuit Miles											
66 kv & up 1964	20	38	18	284	256	229	315	350	130	0	1,637
1965	14	0	100	404	337	79	280	322	153	0	1,691
22-66.9 kv 1964	28	12	0	57	122	92	210	235	72	0	705
1965	38	18	0	59	147	145	280	458	3	0	1,143
Underground—Cable Miles†											
Transmission 1964	0	1	0	35	4	0	4	0	2	0	46
1965	3	0	0	0	13	0	2	4	0	0	22
Distribution 1964	0	76	2	61	76	0	2	11	15	1	264
1965	0	0	2	51	32	4	1	11	10	1	112
Primary Distribution—Pole Miles											
Total 1964	124	231	262	629	1,709	1,423	6,113	1,792	325	0	12,606
1965	18	197	154	285	1,645	1,027	7,085	1,782	270	0	12,564
Rural 1964	21	192	268	287	1,288	1,018	6,080	1,585	10	0	11,149
1965	0	194	154	290	1,215	988	6,908	1,519	10	0	11,269
Substations—Thousands of Kva											
1964	67	15	38	396	2,489	94	79	125	113	0	3,579
1965	15	24	56	542	1,775	59	111	159	229	0	2,952

Capacity—Kva

Hydro 1952	60,252	120,705	92,425	5,696,378	2,917,816	538,500	93,000	166,165	705,298	11,818	10,475,647
1953	74,662	127,851	117,625	6,197,678	2,940,391	538,500	93,000	166,165	794,648	11,818	11,080,128
1954	74,662	131,751	117,625	6,206,576	3,590,791	736,029	93,000	206,165	865,098	11,818	12,034,908
Thermal 1952	19,885	169,786	96,323	46,079	537,475	16,774	260,660	161,998	61,553	1,343	1,870,606
1953	20,223	189,996	102,673	49,229	798,275	17,601	352,969	199,268	79,008	1,343	1,960,985
1954	20,273	202,075	108,683	84,794	779,975	48,601	390,525	219,068	86,683	1,343	1,921,550
Total 1952	79,137	290,561	188,948	5,740,457	3,455,291	555,274	361,660	327,173	846,851	13,201	11,854,255
1953	94,875	313,846	220,198	6,246,907	3,738,766	556,101	445,969	365,575	873,256	13,201	12,041,083
1954	94,875	334,826	223,258	6,291,472	4,367,766	804,621	483,525	426,023	952,541	13,201	13,956,948

Production—Thousands of Kwhr

Hydro 1952	171,577	634,777	529,807	32,139,961	17,696,467	2,695,708	543,411	757,861	8,549,784	*	63,476,451
1953	213,360	694,761	679,652	35,940,863	17,239,920	2,700,098	681,506	795,369	8,116,633	*	61,620,352
1954	282,135	810,000	665,000	34,000,000	19,900,000	2,835,900	830,000	1,000,000	8,760,000	*	64,968,035
Thermal 1952	27,870	497,000	283,188	2,420	429,695	23	530,153	987,669	117,018	*	2,274,584
1953	31,361	556,000	267,290	7,361	1,787,163	1,311	616,000	845,922	110,954	*	3,880,929
1954	35,000	595,000	250,000	4,100	950,000	4,000	720,000	628,000	93,000	*	3,270,169
Total 1952	199,247	954,650	746,995	32,142,381	18,126,200	2,695,731	1,073,564	1,745,530	4,666,804	*	61,745,035
1953	244,721	1,050,860	747,142	35,948,224	19,027,113	2,701,409	1,298,201	1,641,291	5,225,587	*	65,501,281
1954	285,135	1,185,000	840,000	34,004,100	20,850,000	2,839,900	1,550,000	1,628,000	5,873,000	*	68,238,204

Sales—Thousands of Kwhr

Farm 1952	3,025	14,735	20,710	116,073	688,094	78,963	13,117	37,960	47,048	.....	923,325
1953	4,562	17,047	22,839	113,244	698,112	99,[illegible]	16,000	47,222	54,196	.....	987,864
1954	5,220	18,471	25,552	127,356	870,648	110,000	19,200	73,501	63,107	.....	1,083,092
Residential 1952	20,505	174,977	92,149	1,363,718	4,120,642	746,494	171,897	195,276	241,129	3,118	7,917,867
1953	24,144	208,200	104,612	1,890,000	4,577,000	798,200	194,036	239,299	646,742	3,669	8,846,229
1954	28,262	227,511	118,123	2,080,000	4,971,047	841,648	201,454	262,727	672,136	3,768	9,794,098
Commercial Light 1952	20,814	85,215	61,899	860,104	1,602,983	215,755	95,829	154,753	374,015	2,115	3,473,382
1953	25,971	92,377	67,170	956,000	1,776,884	235,241	109,697	177,304	405,501	2,549	3,848,213
1954	29,709	100,111	76,692	1,048,000	1,925,116	246,526	122,367	192,888	440,126	2,955	4,186,539
Small Power 1952	9,127	26,120	36,228	161,971	289,847	82,525	68,951	89,642	68,571	863	722,635
1953	9,704	29,572	41,679	188,000	295,021	94,071	68,000	79,112	74,007	926	780,092
1954	11,223	31,489	46,996	196,000	298,989	96,697	68,707	88,556	84,465	1,251	907,374
Large Power 1952	115,866	328,567	437,901	23,561,208	10,673,588	1,614,310	114,397	503,977	1,154,946	24,967	39,789,520
1953	166,977	544,910	488,579	29,706,000	10,043,221	1,580,868	115,935	666,736	1,427,217	74,213	45,220,654
1954	171,856	556,270	518,257	28,200,000	11,399,963	1,697,444	118,112	712,252	1,834,293	79,389	47,088,016
Other 1952	6,963	13,217	13,203	312,023	892,999	160,812	13,675	68,208	60,799	6,681	1,268,940
1953	7,051	14,439	14,039	324,000	648,691	186,179	14,000	80,915	92,442	8,182	1,390,938
1954	7,184	14,758	14,126	290,000	607,223	198,666	14,750	83,683	112,132	9,397	1,411,918
Total 1952	230,350	642,871	671,540	26,575,977	17,709,868	2,899,860	1,016,994	1,448,816	8,427,129	68,344	53,900,884
1953	287,209	906,551	739,397	33,081,244	18,645,878	2,990,250	994,171	1,290,586	8,898,195	93,568	61,545,329
1954	336,105	948,601	882,346	33,900,356	19,687,766	3,149,461	979,890	1,360,687	9,906,259	98,932	64,345,063

Customers

Farm 1952	3,760	20,560	26,354	95,997	125,499	29,623	8,941	13,818	18,549	9	329,870
1953	4,100	21,662	28,260	97,700	127,551	33,672	9,500	15,513	19,102	9	352,128
1954	4,516	21,572	40,175	100,000	130,188	39,117	10,000	24,602	20,416	9	404,501
Residential 1952	40,000	115,615	69,447	760,000	1,004,314	120,931	101,677	144,541	203,990	1,967	2,732,495
1953	46,140	120,722	75,410	800,000	1,140,856	140,000	105,000	155,000	290,316	2,979	2,886,023
1954	50,762	125,891	77,570	850,000	1,302,894	148,096	105,000	162,000	312,076	3,728	3,062,848
Commercial Light 1952	4,000	17,651	12,401	108,642	140,271	26,819	24,054	29,478	48,149	445	422,428
1953	4,740	18,627	13,765	110,000	157,818	27,000	24,000	34,092	51,099	468	440,377
1954	4,865	18,739	15,146	110,000	166,398	30,734	25,000	35,790	54,172	471	460,148
Small Power 1952	600	3,692	1,619	13,488	17,585	6,299	8,776	9,564	6,223	105	68,649
1953	675	3,719	1,729	13,800	18,246	6,800	8,800	10,300	6,406	129	68,754
1954	625	3,875	1,836	14,200	18,872	7,045	8,800	10,825	6,795	139	68,707
Large Power 1952	66	770	190	2,897	4,595	1,947	807	2,250	1,289	55	10,196
1953	73	799	198	3,220	4,734	1,984	805	2,685	1,373	88	10,909
1954	82	829	198	3,350	4,947	1,798	810	3,071	1,388	88	10,963
Other 1952	44	130	118	1,546	1,266	891	699	186	11	11	4,967
1953	64	128	118	1,600	1,545	666	698	434	191	11	5,173
1954	65	128	118	1,600	1,525	682	650	450	217	11	5,483
Total 1952	48,470	158,418	109,129	982,264	1,293,231	286,685	139,155	200,259	278,235	2,591	3,568,605
1953	55,792	165,257	127,472	1,025,320	1,607,502	289,122	148,803	221,222	378,581	3,726	3,816,023
1954	62,865	170,705	134,702	1,077,200	1,632,439	240,894	146,870	238,836	895,197	4,369	4,615,013

Source: 1952, 1954, 1955 Electrical World Surveys. 1952 Dominion Bureau of Statistics. * Yukon & N.W.T. not included in DBS monthly memorandum on Central Electric Stations.

Additions Reported to Electrical World—Kw

New England

Power Companies		Capacity End 1954	1954	1955	1956	1957	After 1957
Bangor Hydro-Electric	Hydro	39,500					25,000
	Steam	11,500	11,500				
	IC	6,000					
	GT	10,000					25,000
	Total	67,000	11,500				
Boston Edison	Hydro	300					137,500
	Steam	801,360	90,000				137,500
	Total	801,660	90,000				
Central Maine Power†	Hydro	235,579	45,000	31,500			
	Steam	158,000		33,000			
	IC	6,442					
	Total	400,021	45,000	64,500			
Central Vermont Public Service & Connecticut Valley Electric	Hydro	41,197			3,000		
	Steam	4,500					
	IC	2,500					
	GT	18,000			6,000		
	Total	66,197			9,000		
Citizens Utilities	Hydro	5,000			1,000		
	IC	6,900					
	Total	11,900			1,000		
Connecticut Light & Power	Hydro	74,729		37,250			
	Steam	466,000			100,000		
	GT	25,000	6,000				
	Total	546,729	6,000	37,250	100,000		
Hartford Electric Light	Hydro	1,500					100,000
	Steam	322,000	72,000				100,000
	Total	323,500	72,000				
Maine Public Service†	Hydro	2,300					
	Steam	7,500		12,650			
	IC	9,100					
	Total	18,900					65,000
Montaup Electric	Steam	190,000					
New England Electric System	Hydro	350,975			150,000		
	Steam	698,520	90,000				
	IC	10,000	5,000				
	Total	1,039,495	95,000		150,000		
Public Service of New Hampshire	Hydro	77,350					
	Steam	148,750		50,000			
	IC	3,000					
	Total	229,100		50,000			
United Illuminating	Steam	281,000					75,000
Total	Hydro	800,421	45,000	68,750	154,000		325,500
	Steam	3,071,130	263,500	95,650	100,000		
	IC	44,022	5,000				
	GT	32,000	6,000		6,000		
	Total	3,973,573	319,500	164,400	260,000		403,500

Municipal, State and Power District Systems

Norwich, Conn.	Hydro	1,600					5,000
	Steam	14,250			5,000		5,000
	Total	15,850			5,000		
Braintree, Mass.	Steam	25,500					15,000
Holyoke, Mass†	Steam			9,375			
Hudson, Mass.	IC	8,500		3,600			

East North Central

Power Companies		Capacity End 1954	1954	1955	1956	1957	After 1957
Central Illinois Electric & Gas	Hydro	1,200					
	Steam	131,750		30,000			
	IC	750					
	Total	133,700		30,000			
Central Illinois Light	Steam	241,000				100,000	
Central Illinois Public Service	Steam	380,000	70,000			112,000	
Cincinnati Gas & Electric Co.	Steam	825,600	125,000			150,000	
Cleveland Electric Illuminating	Steam	1,260,000	140,000	208,000			
Columbus & Southern Ohio Electric †	Steam	446,000	66,000	100,000			
	IC	200					
	Total	446,200	66,000	100,000			
Commonwealth Edison & Sub's.	Hydro	9,865					
	Steam	3,450,500	160,000	320,000	207,000		
	Total	3,457,365	160,000	320,000	207,000		
Consumers Power	Hydro	133,170					
	Steam	1,212,500		142,000	142,000	142,000	
	IC	6,498					
	Total	1,402,168		142,000	142,000	142,000	
Detroit Edison	Hydro	7,850					
	Steam	2,200,000	250,000		100,000	300,000	
	Total	2,207,850	250,000		100,000	300,000	
Edison Sault Electric	Hydro	18,400					
	Steam	2,000					
	IC	4,619		1,500	1,500	1,500	
	Total	25,019		1,500	1,500	1,500	
Electric Energy Inc.	Steam	625,000	312,000	312,000			

Municipal, State and Power District Systems

		Capacity End 1954	1954	1955	1956	1957	After 1957
Vinton, N.Y. †	Steam	25,500		12,500			
New York Power Authority	Hydro						910,000
Chambersburg, Pa.	Steam	11,000		5,000	5,000		
Ephrata, Pa.	Steam	2,500	2,500				5,000
Jamestown, N. Y.	Steam	38,500					75,000
Quakertown, Pa.	IC	1,100	1,100			1,500	2,000
Total	Hydro						910,000
	Steam	95,500	2,500	17,500	5,000		35,000
	IC	1,100	1,100			1,500	2,000
	Total	96,600	3,600	17,500	5,000	1,500	947,000

Middle Atlantic Total All Agencies							
	Hydro	1,798,749	10,250	47,500	25,500	34,000	1,105,000
	Steam	15,713,961	1,646,000	1,095,000	307,500	785,000	1,417,500
	IC	4,868	1,100			1,500	2,000
	GT						
	Total	17,456,778	1,666,600	1,142,500	334,000	820,500	2,124,500

Taunton, Mass.	Steam	34,000		10,000				10,000
Total	Hydro	1,600						
	Steam	11,750		19,375	5,000			30,000
	IC	9,500		3,600				
	Total	61,850		22,975	5,000			30,000
New England Total 58 Agencies	Hydro	219,871	45,000	68,750	154,000			
	Steam	3,142,500	253,500	115,025	185,000			635,500
	IC	52,522	5,000	3,600				
	GT	52,000	6,000		6,000			
	Total	4,057,423	319,500	187,375	265,000			635,500

Middle Atlantic

Power Companies								
Atlantic City Electric	Steam	318,000	75,000					
Central Hudson Gas & Electric	Hydro	47,820						
	Steam	122,000	66,000					
	Total	169,820	66,000					
Consolidated Edison of N. Y.	Steam	3,536,000	180,000	180,000				
Duquesne Light	Steam	1,010,000	120,000	150,000		60,000		
Jersey Central Power & Light	Steam	263,724		137,500				137,500
Long Island Lighting	Steam	387,600	115,000		170,000			170,000
Metropolitan Edison	Hydro	20,620						165,000
	Steam	681,500						
	Total	702,120						165,000
New York State Electric & Gas	Hydro	41,365		7,000	4,000			
	Steam	467,750	108,000	135,000				
	IC	2,968						
	Total	512,183	108,000	142,000	4,000			
Niagara Mohawk Power	Hydro	1,055,929	19,350	22,500	22,500	34,000		
	Steam	1,675,000	204,000			200,000		
	Total	2,730,929	223,350	22,500	22,500	234,000		
Pennsylvania Electric	Hydro	52,100						
	Steam	759,362	270,000					
	Total	811,462	270,000					
Pennsylvania Power	Steam	155,000						85,000
Pennsylvania Power & Light Co	Hydro	60,000						
	Steam	975,950	132,500		132,500			150,000
	Total	1,015,950	132,500		132,500			150,000
Pennsylvania Water & Power	Hydro	103,000						
	Steam	106,900	78,000					
	Total	209,900	78,000					
Philadelphia Electric & Sub's	Hydro	252,000						
	Steam	2,035,250	151,000	220,000				650,000
	Total	2,287,250	151,000	220,000				650,000
Public Service Electric & Gas	Steam	1,881,500		185,000		650,000		
Rochester Gas & Electric	Hydro	49,940						
	Steam	294,750				75,000		
	Total	345,790				75,000		
Rockland Light & Power & Sub's	Hydro	25,570		18,000				
	Steam	54,275		70,000				
	Total	79,845		88,000				
West Penn Power & Sub's	Hydro	52,000						
	Steam	881,000	118,000					
	Total	933,000	133,000					
Total	Hydro	1,738,544	19,350	47,500	26,500	34,000		165,000
	Steam	15,618,461	1,643,500	1,075,500	202,500	785,000		902,500
	IC	2,968						
	Total	17,360,173	1,662,850	1,123,000	329,000	819,000		1,137,500

Illinois Power	Hydro	2,024						
	Steam	609,640	100,000	75,000	100,000			
	IC	2,000						
	Total	503,664	100,000	75,000	100,000			
Indiana Kentucky Electric	Steam			600,000	600,000			
Indiana & Michigan Electric	Hydro	23,504						
	Steam	650,750	215,000					
	Total	674,254	215,000					
Indianapolis Power & Light	Steam	496,000			105,000			
Lake Superior District Power	Hydro	11,968						
	Steam	55,000	14,000					
	IC	4,000						
	Total	70,968	14,000					
Madison Gas & Electric	Steam	85,000				14,000		
Mount Carmel Public Utility	Steam	14,500				7,500		
Northern Indiana Public Service	Hydro	19,005						
	Steam	208,830			125,000			
	Total	227,835			125,000			
Northern States Power (Wis)	Hydro	123,845			4,200			
	Steam	54,500						
	IC	3,100						
	Total	181,445			4,200			
Ohio Edison & Pennsylvania Power	Hydro	1,950						
	Steam	1,335,350	212,000	270,000		90,000		
	IC	256						
	Total	1,337,556	212,000	270,000		90,000		
Ohio Power	Hydro	3,000						
	Steam	927,500	215,000		845,000			
	Total	930,500	215,000		845,000			
Ohio Valley Electric	Steam			800,000	200,000			
Oxford Light & Power	Hydro	105		50				
	IC	75						
	Total	180		50				
Public Service of Indiana	Hydro	3,200						
	Steam	772,000	93,000	90,000	125,000			300,000
	Total	775,200	90,000	90,000	125,000			300,000
Southern Indiana Gas & Electric	Steam	120,000		44,100				
Toledo Edison	Hydro	5,000						
	Steam	334,000		135,000				135,000
	Total	339,000		135,000				135,000
Upper Peninsula Generating?	Hydro	14,200						
	Steam	5,500		22,000				
	Total	19,700		22,000				
Wisconsin Electric Power	Hydro	415						
	Steam	1,074,500	120,000	120,000				
	Total	1,074,915	120,000	120,000				
Wisconsin Hydro Electric	Hydro	6,668				1,000		3,000
	Steam							10,000
	IC	5,000						
	Total	10,668				1,000		13,000
Wisconsin Power & Light	Hydro	62,200						
	Steam	252,500	6,100	75,000				200,000
	Total	291,600	76,100	75,000				200,000
Wisconsin Public Service	Hydro	62,565						
	Steam	272,000	66,000					66,000
	IC	3,000						
	Total	338,700	66,000					66,000
Total	Hydro	585,039			58	4,293	1,000	3,000
	Steam	15,220,470	2,299,100	3,233,100	2,239,600	941,500	711,000	
	IC	36,396		1,500	1,500	1,500		
	Total	16,736,727	2,299,100	3,544,650	2,241,700	948,000	714,000	

		Capacity End 1953	1954	1955	1956	1957	After 1957
Municipal, State and Power District Systems							
Gunnison, Ill.	IC	4,421				1,500	
Winnetka, Ill.	Steam	15,500	5,000				10,000
Crawfordsville, Ind	Steam	16,000		11,500			
Logansport, Ind.†	Steam	12,500		16,500			
Richmond, Ind	Steam	45,000		30,000			
Crystal Falls, Mich.	Hydro	950	500				
Detroit, Mich.	Steam	130,000			50,000		
Holland, Mich.	Steam	21,500					11,500
Kalamazoo, Mich†	Steam	7,600			9,375		
Lansing, Mich.	Hydro	1,200					
	Steam	103,250	44,000				44,000
	Total	104,450	44,000				44,000
Lowell, Mich	Hydro	700					
	IC	2,864		2,272		1,200	
	Total	3,650		2,272		1,200	
Petoskey, Mich.	Hydro	870					
	IC	4,250			1,250		1,250
	Total	5,150			1,250		1,250
Sebewaing, Mich.	IC	3,017	1,250				
South Haven, Mich.	Steam	10,000			7,500		
Wyandotte, Mich.	Steam	23,500				20,000	
Clyde, Ohio	Steam	2,000					
	IC	2,840	2,840				
	Total	4,840	2,840				
Columbus, Ohio†	Steam	33,000		15,625			
Dover, Ohio	Steam	8,410		7,500			7,500
Hamilton, Ohio	Steam	33,500	1,000			20,000	
Hiram, Ohio	IC	822			600		
Oberlin, Ohio	IC	3,329			2,000		
Orrville, Ohio	Steam	16,000	7,500				7,500
Piqua, Ohio	Steam					10,000	
Tipp City, Ohio	Steam	1,500					
	IC	2,400				1,500	
	Total	3,900				1,500	
Willard, Ohio	Steam	3,600					1,000
Manitowoc, Wisc	Steam	39,000		22,000			
Menasha, Wisc†	Steam	9,600		9,375			
Total	Hydro	3,815	500				
	Steam	607,960	57,500	112,500	66,875	30,000	81,500
	IC	35,823	4,090	2,272	3,850	4,200	1,250
	Total	657,798	62,090	114,772	70,725	34,200	85,750
Cooperatives							
Cloverland	IC			3,000			
Dairyland Power	Hydro	19,250					
	Steam	83,000	34,500		50,000		

		Capacity End 1953	1954	1955	1956	1957	After 1957
Northern States Power (Minn)	Hydro	59,470	7,425	4,975			
	Steam	853,170	130,000	100,000	100,000		100,000
	IC	30,415	2,760				
	Total	943,055	140,185	104,975	100,000		100,000
Otter Tail Power	Hydro	5,755					
	Steam	95,000					50,000
	IC	25,845					
	Total	126,600					50,000
Union Electric of Missouri & Union Electric Power	Hydro	293,000					
	Steam	1,100,000	142,000				500,000
	Total	1,393,000	142,000				500,000
Western Light & Telephone	Steam	64,200		16,500		16,500	
	IC	23,941					
	Total	88,594		16,500		16,500	
Total	Hydro	397,897	7,425	4,975			
	Steam	4,293,274	457,799	349,360	251,800	215,200	1,007,000
	IC	188,422	12,264	2,000			
	Total	5,179,293	477,589	356,435	251,800	215,200	1,007,000
Municipal, State and Power District Systems							
Atlantic, Iowa	Steam	6,250			5,000		
Pancroft, Iowa	IC	950		500			
Cascade, Iowa	IC	1,463				600	
Cedar Falls, Iowa	Hydro	1,200					
	Steam	14,000	5,000				10,000
	IC	1,200					
	Total	16,400	5,000				10,000
Forest City, Iowa	IC	1,965		1,100			
Lamoni, Iowa	IC	2,573	1,123				
Muscatine, Iowa	Steam	27,000					25,000
Remsen, Iowa	IC	1,181			1,000		
State Center, Iowa	IC	1,253		750			
Webster City, Iowa	Steam	3,875				7,500	
[illegible], Minn	Steam	7,750		7,500			
Fulton, Mo.	Steam	6,125			6,000		
Springfield, Mo	Steam	23,900				41,000	66,000
Auburn, Neb	Hydro			2,000			
	IC	750					
	GT	2,000					
	Total	2,750		2,000			
Fairbury, Neb	Hydro	200					
	Steam	8,500				6,000	
	IC				500		
	Total	8,700			600	6,000	
Fremont, Neb	Steam	21,500				16,500	
Hastings, Neb	Steam	17,500			16,500		
Omaha PPD, Neb	Steam	75,000	78,700*			105,000	
Sidney, Neb	IC	3,500		2,000			2,000
Wayne, Neb.	IC	3,230				1,500	2,000
Elk River, Minn	Hydro	240					
	IC	1,100			2,000		
	Total	1,340			2,000		
Grand Marais, Minn	IC	1,112		800			
Kenyon, Minn.	IC	1,925		1,500			

	IC	13,790						
	Total	116,230	24,500		50,000			
Northern Michigan	Hydro	1,720						
	Steam	15,000					7,500	
	IC	6,490						
	Total	21,210					7,500	
Wolverine	IC				2,500			5,000
Total	Hydro	72,670						
	Steam	98,000	24,500		50,000	7,500		
	IC	18,250		3,000	2,500			5,000
	Total	187,290	24,500	3,000	52,500	7,500		5,000
Federal Agencies								
Corps of Engineers	Hydro	38,600	3,000					
East North Central Total All Agencies	Hydro	569,104	3,000	50	4,200	1,000		2,500
	Steam	10,926,630	2,331,100	3,662,600	2,335,675	1,002,000		795,100
	IC	62,551	4,000	6,772	7,650	5,700		6,200
	Total	19,556,285	2,337,200	3,662,422	2,347,725	1,007,700		804,750
West North Central								
Power Companies								
Black Hills Power & Light	Hydro	1,346						
	Steam	61,000	16,500†		16,500			
	IC	2,513						
	Total	75,859	16,500†		16,500			
Central Kansas Power†	Steam	31,100	12,600	5,000				
	IC	5,550						
	Total	36,650	12,600	5,000				
Empire District Electric	Hydro	19,425						
	Steam	127,000	60,000					
	IC	2,276						
	Total	189,201	60,000					
Interstate Power	Hydro	5,442						
	Steam	141,450					33,000	
	IC	4,035						
	Total	150,927					33,000	
Iowa Electric Light & Power	Hydro	5,873						
	Steam	180,622		65,000			66,000	
	IC	42,657	9,504†	2,000				
	Total	233,308	9,504†	63,000			66,000	
Iowa-Illinois Gas & Electric	Hydro	6,000						
	Steam	221,479		25,000				
	IC	1,000						
	Total	228,479		25,000				
Iowa Power & Light	Hydro	600						
	Steam	260,750	110,000					75,000
	IC	10,347						
	Total	280,697	110,000					75,000
Iowa Public Service	Hydro	2,651						
	Steam	160,200						44,000
	IC	23,785						
	Total	186,136						44,000
Iowa Southern Utilities	Steam	74,550					22,000	
	IC	5,000						
	Total	79,550					22,000	
Kansas City Power & Light	Steam	385,350		100,000				160,000
Kansas Gas & Electric	Hydro	375						
	Steam	308,030	151,600		115,000			
	IC	1,700						
	Total	307,055	151,600		115,000			
Kansas Power & Light	Hydro	1,800						
	Steam	219,250	55,000	37,000			78,000	78,000
	IC	2,958						
	Total	323,208	55,000	37,000			78,000	78,000
LeSueur, Minn	IC							2,000
New Ulm, Minn	Steam	9,750		6,000				
North Branch, Minn	IC	650				750		
Owatonna, Minn	Steam	8,500				6,000		
Sleepy Eye, Minn	Steam	3,200		1,500				
	IC	625						
	Total	3,825		1,500				
Springfield, Minn	Steam	5,750						3,000
Wells, Minn	IC	3,891	1,360				1,360	
Woodbine, Iowa	IC	1,589	784					
Clay Center, Kan	Steam	7,500					3,000	
	IC			1,000				
	Total	7,500		1,000			3,000	
Herington, Kan	IC	3,095				1,500		
Kansas City, Kan	Steam	169,000	60,000				41,000	66,000
McPherson, Kan	Steam	18,500				10,000		
	IC	1,000						
	GT							10,000
	Total	16,500				10,000		10,000
Osawka, Kan	IC	1,809	775					
Osage City, Kan	IC	1,671		908				1,000
Sterling, Kan	IC	1,550		900				
Wellington, Kan†	Steam	7,500				7,500		
Barnesville, Minn	IC	970		670				
Commonw's Public Power District	Hydro	9,115						
	Steam	15,790		9,375			75,000	
	IC	17,732						
	Total	42,597		9,375			75,000	
Nebraska Public Power System	Hydro	129,651						
	Steam	146,500					72,000	
	IC	2,976						
	Total	279,077					72,000	
Total	Hydro	140,396		2,000				
	Steam	998,350	123,700	24,375	81,000	373,000		170,000
	IC	91,569	4,102	10,216	5,850	5,700		7,000
	GT	2,000						10,000
	Total	882,315	127,802	36,591	86,850	376,700		187,000
Cooperatives								
Pardee Counties Power	Hydro	600		520				
	IC			1,580				3,000
	Total	600		2,100				3,000
Central Iowa Power	Steam	44,000						44,000
East River	Steam							15,000
North West Power	Steam	40,000	40,000					
Pioneer	IC	4,653	1,345				1,500	
Western Minn Power	IC	6,525		7,385				
Woodbine	IC	11,992	2,345	2,345	2,345			7,055
Total	Hydro	600		600				
	Steam	84,000	40,000					59,000
	IC	22,200	3,690	9,730	2,345	1,500		10,055
	Total	106,800	43,690	9,730	2,345	1,500		69,055
Federal Agencies								
Corps of Engineers	Hydro	160,000	160,000	206,000	153,333	66,666		283,000

		Capacity End 1953	1954	1955	1956	1957	After 1957
West North Central Total All Agencies	Hydro	608,055	107,425	287,573	153,333	66,666	385,000
	Steam	5,275,620	821,400	373,875	282,500	568,500	1,256,000
	IC	312,271	20,056	17,366	8,106	5,250	17,805
	GT	2,000					10,000
	Total	6,205,788	1,088,881	678,816	444,088	640,426	1,048,935
Power Companies		**South Atlantic**					
Appalachian Electric Power	Hydro	121,667	2,500				
	Steam			225,000			
	Total	121,667	2,500	225,000			
Carolina Power & Light	Hydro	280,000					
	Steam	690,500	108,000	108,000	136,000		
	IC	1,500					
	Total	697,000	108,000	108,000	136,000		
Consolidated Gas Electric Light & Power Co of Baltimore	Steam	830,000			125,000		
Delaware Power & Light	Steam	223,600	75,000				75,000
Duke Power	Hydro	697,273					
	Steam	1,229,400	266,000	150,000		165,000	
	IC	575					
	Total	1,927,248	266,000	150,000		165,000	
Eastern Shore Public Service of Md	Steam	87,000					
	IC	3,905					
	Total	90,905					
Florida Power Corp.	Hydro	13,303					
	Steam	376,000	76,000	70,000	70,000	105,000	
	IC	5,828					
	Total	394,121	76,000	70,000	70,000	105,000	
Florida Power & Light	Steam	722,300	80,000	140,000	80,000	140,000	
	IC	10,050					
	Total	742,350	80,000	140,000	80,000	140,000	
Georgia Power	Hydro	261,820		10,000			48,000
	Steam	996,500	218,400	109,200		133,900	109,200
	Total	1,348,330	218,400	119,200		133,900	157,200
Monongahela Power & Sub's	Steam	430,325	135,000				135,000
	IC	3,600	150				
	Total	434,023	135,150				135,000
Nantahala Power & Light	Hydro	85,625	9,000	10,000			
Potomac Electric Power	Steam	780,000	100,000		100,000		
South Carolina Electric & Gas	Hydro	174,360					
	Steam	326,500	75,000	100,000			120,000
	IC	150					
	Total	501,010	75,000	100,000			120,000
Tampa Electric	Steam	380,500		72,000			110,000
Virginia Electric & Power	Hydro	61,050		100,000			
	Steam	938,500	105,000	105,000			
	IC	1,000					
	Total	956,499	105,000	205,000			
Total	Hydro	1,495,107	11,000	120,000			48,000
	Steam	7,809,625	1,238,400	1,079,200	511,000	543,900	549,200
	IC	27,305	150				
	Total	9,332,118	1,249,930	1,200,000	511,000	543,900	597,200
Municipal, State and Power District Systems							
Dover, Del.	Steam	4,500		6,250			
Gainesville, Fla.	Steam	10,160		12,650			
Jacksonville, Fla.	Steam	172,500		68,000			
Key West, Fla.	Steam	10,000		16,500			

		Capacity End 1953	1954	1955	1956	1957	After 1957
Tennessee Valley Authority	Hydro	2,577,900	44,000				
	Steam	3,317,250	1,500,000	2,850,000	450,000		
	Total	5,895,150	1,544,000	2,850,000	450,000		
Total	Hydro	3,022,905	44,000	75,000	75,000	40,000	450,500
	Steam	3,317,250	1,500,000	2,850,000	450,000		
	Total	6,691,150	1,544,000	2,925,000	525,000	40,000	450,500
West South Central Total All Agencies							
	Hydro	3,686,360	44,000	75,000	75,000	40,000	770,500
	Steam	5,269,500	1,967,000	2,853,000	1,262,400	381,500	267,000
	IC	500					
	Total	8,956,360	2,011,000	2,928,000	1,337,400	420,500	617,900
Power Companies		**West South Central**					
Arkansas Power & Light	Hydro	63,500					
	Steam	722,750	266,000				200,000
	IC	672					
	Total	789,922	266,000				200,000
Central Louisiana Electric	Steam	65,000			54,000		108,000
	IC	19,858					
	Total	84,858			54,000		108,000
Central Power & Light	Hydro	15,000					
	Steam	283,000	66,000	99,000	66,000		66,000
	IC	3,930					
	Total	301,930	66,000	99,000	66,000		66,000
Dallas Power & Light	Steam	296,250	75,000	115,000	115,000	165,000	
	IC	6,000					
	Total	402,250	75,000	115,000	115,000	165,000	
El Paso Electric	Steam	20,000	35,000			44,000	
Gulf States Utilities Co	Steam	650,500	80,000		100,000		100,000
Houston Lighting & Power	Steam	1,015,000	200,000	150,000	134,000		
Louisiana Power & Light	Steam	296,750		125,000			
	IC	736					
	Total	297,486		125,000			
New Orleans Public Service	Steam	415,000	82,000			100,000	
Oklahoma Gas & Electric	Steam	391,496		110,000	170,000		170,000
	IC	5,599					
	GT	7,500					
	Total	404,595		110,000	170,000		170,000
Public Service of Oklahoma	Hydro	500					
	Steam	406,858	80,000		165,000	60,000	165,000
	IC	6,731					
	GT	6,000					
	Total	420,089	80,000		165,000	60,000	165,000
Southwestern Gas & Electric	Steam	237,500	50,000		75,000	113,000	113,000
Southwestern Public Service	Hydro	410					
	Steam	473,000	52,500	165,000			
	IC	13,658					
	Total	487,068	52,500	165,000			
Texas Electric Service	Steam	618,050	185,000			155,000	
	IC	11,948					
	Total	629,998	185,000			155,000	
Texas Power & Light	Steam	337,300	100,000	165,000			
	IC	7,450					
	GT	3,500					
	Total	348,250	100,000	165,000			
West Texas Utilities	Steam	198,500	1,500	33,000			
	IC	10,470		1,000	1,000		
	GT	10,000					
	Total	218,970		34,000	1,000		

	IC	6,200						
	Total	16,200		16,500				
Lakeland, Fla.	Steam	52,500		25,000				
Orlando, Fla.†	Steam	105,000		35,000				
Crisp County Power Commission	Hydro	13,000		5,000				
	Steam						7,500	
	GT						5,000	
	Total	13,000		5,000			12,500	
Danville, Virginia	Hydro	10,000						
	Steam	29,500						15,000
	Total	39,500						15,000
Total	Hydro	25,000		5,000				
	Steam	364,100		181,400			7,500	15,000
	IC	6,200						
	GT						5,000	
	Total	395,300		186,400			12,500	15,000
Federal Agencies								
Corps of Engineers	Hydro	572,000	40,000				40,000	82,000
Tennessee Valley Authority	Hydro	290,100	77,500	74,500				
Total	Hydro	862,100	117,500	74,500			40,000	82,000
South Atlantic Total All Agencies	Hydro	2,380,207	128,900	209,200			40,000	130,000
	Steam	8,173,785	1,238,400	1,366,600	511,000	551,400		564,200
	IC	53,775	130					
	GT						5,000	
	Total	10,587,768	1,367,430	1,460,900	511,000	896,400		694,200
East South Central								
Power Companies								
Alabama Power	Hydro	489,700						320,000
	Steam	890,000	267,000			167,400		167,400
	Total	1,379,700	267,000			167,400		487,400
Kentucky Utilities	Hydro	26,340						
	Steam	323,150	60,000			100,000		
	Total	354,290	60,000			100,000		
Louisville Gas & Electric & Sub	Hydro	89,325						
	Steam	518,300	100,000			100,000		100,000
	Total	598,325	100,000			100,000		100,000
Mississippi Power	Steam	147,500					80,500	
	IC	840						
	Total	148,340					80,500	
Mississippi Valley Generating†	Steam					600,000	220,000	
Total	Hydro	609,360						320,000
	Steam	1,878,250	427,000			897,400	300,500	267,400
	IC	840						
	Total	2,477,650	427,000			897,400	300,500	587,400
Municipal, State and Power District Systems								
Greenwood, Miss.	Steam	20,500		5,000			15,000	
Dyersburg, Tenn.	Steam	10,500			5,000			
Total	Steam	30,000		5,000	5,000		15,000	
Cooperatives								
East Kentucky	Steam	40,000	40,000				66,000	
Federal Agencies								
Corps of Engineers	Hydro	700,000		75,000	75,000	49,000		450,500
Total	Hydro	81,210						
	Steam	6,544,934	1,273,000	940,000	901,000	627,000		922,000
	IC	27,356			1,000			
	GT	27,000						
	Total	6,710,502	1,273,000	940,000	902,000	627,000		922,000
Municipal, State and Power District Systems								
Jonesboro, Ark.	Steam	22,500						15,000
Homer, La.	IC	2,290		1,000				
Ruston, La.	IC	8,900						3,000
Lafayette, La.	Hydro				12,650			
	Steam	8,000						
	IC	6,242						
	Total	14,242			12,650			
Minden, La.	IC	4,877		2,500				
Monroe, La†	Steam	27,000		9,375				
Cushing, Okla.	IC	4,260		3,500				
Marlow, Okla.	IC	2,660		1,600				
Newkirk, Okla.	IC	1,450	700					
Stillwater, Okla.	Steam	8,000			10,000			
Wewoka, Okla.	IC	905		500				
Austin, Texas	Steam	66,000		44,000				44,000
Bryan, Texas	Steam	10,000	10,000	1,500				
	IC	4,750						
	Total	14,750	10,000	1,500				
Cameron, Texas	Steam	2,600						
	IC	1,250		1,500				
	Total	3,850		1,500				
Crosbyton, Texas	IC	1,245			600			
Denton, Texas†	Steam	14,650		23,000				
Lubbock, Texas	Steam	35,500						22,000
	IC	9,150						
	Total	44,650						22,000
San Antonio, Texas	Steam	296,500	71,000		102,000			102,000
Spur, Texas	IC	924		500				
Vernon, Texas	IC		5,200					
Total	Hydro				12,650			
	Steam	490,350	81,000	77,875	112,000			183,000
	IC	48,253	5,900	12,200	600			3,000
	Total	538,603	86,900	90,135	125,250			186,000
Cooperatives								
North Arkansas	Hydro	2,860	192		1,500			
Federal Agencies								
Corps of Engineers	Hydro	426,000	30,000	75,000				666,00
International Boundary & Water Commission	Hydro	31,500	21,000					
Total	Hydro	657,500	51,000	75,000				666,000
West South Central Total All Agencies	Hydro	341,579	51,192	75,000	14,150			666,000
	Steam	7,035,284	1,354,000	1,025,875	1,013,000	627,000		1,105,000
	IC	135,471	5,900	13,220	1,600			3,000
	GT	27,000						
	Total	7,739,474	1,411,092	1,114,156	1,028,750	627,000		1,774,000

		Capacity End 1954	1954	1955	1956	1957	After 1957
Mountain							
Power Companies							
Arizona Public Service	Hydro	7,000					
	Steam	264,250	100,000	100,000			200,000
	IC	25,200					
	Total	296,450	100,000	100,000			200,000
Idaho Power	Hydro	372,375			151,000		632,000
	IC	1,400					
	Total	373,775			151,000		632,000
Montana Power	Hydro	421,940					120,000
	Steam	60,000					
	Total	481,940					120,000
Public Service of Colorado	Hydro	41,635					
	Steam	383,100	72,000	100,000	15,000	100,000	
	IC	2,250					
	Total	426,985	72,000	100,000	15,000	100,000	
Public Service of New Mexico	Steam	124,000	33,500			33,500	
Southern Colorado Power	Hydro	1,500					
	Steam	48,468		16,500			33,000
	Total	49,968		16,500			33,000
Southern Nevada Power†	Steam			66,000			
Tucson Gas, Electric Light & Power	Steam	40,000				60,000	
Utah Power & Light	Hydro	176,130	950				
	Steam	310,750	65,000	100,000			
	IC	3,126					
	Total	490,006	66,000	100,000			
Western Colorado Power	Hydro	18,232					
	Steam	13,540			9,375		
	Total	31,782			9,375		
Total	Hydro	1,023,812	950		151,000		752,000
	Steam	1,549,448	271,500	260,500	24,375	193,500	233,000
	IC	31,976					
	Total	2,314,856	272,450	260,500	175,375	193,500	985,000
Municipal, State and Power District Systems							
Colorado Springs, Colo	Hydro	6,000					
	Steam	55,000	15,000		22,000		
	Total	61,000	15,000		22,000		
Soda Springs, Idaho	Hydro	350		350			
Basin, Wyo	Hydro	300					
	Steam			6,000			
	IC	4,871	500				
	Total	5,171	500	6,000			
Bountiful, Utah	IC	1,525		1,000			
Salt River Project Agricultural	Hydro	70,890					
	Steam	120,000	66,000		110,000		110,000
	IC	10,000					
	Total	200,890	66,000		110,000		110,000
Total	Hydro	77,440		350			
	Steam	175,000	81,000	6,000	132,000		110,000
	IC	16,496	500	1,000			
	Total	268,936	81,500	7,350	132,000		110,000
Cooperatives							
Garkane Power	Hydro	150		150		1,000	500
	Steam	250					
	Total	400		150		1,000	500
Northern Rio Arriba	Steam	33,000	33,000			16,500	16,500

		Capacity End 1954	1954	1955	1956	1957	After 1957
PUD No 1 Pend Oreille County†	Hydro			60,000			
Seattle, Wash	Hydro	551,656	90,000		90,000		45,000
	Steam	53,000					
	Total	604,656	90,000		90,000		45,000
Tacoma, Wash	Hydro	238,000					660,000
	Steam	59,000	25,000				
	Total	297,000	25,000				660,000
Total	Hydro	1,789,656	90,000	60,000	126,200	20,000	720,000
	Steam	968,000	225,000	322,000		196,000	176,000
	IC	13,276					
	Total	2,761,332	315,000	412,000	126,200	226,000	896,000
Federal Agencies							
Bureau of Reclamation	Hydro	4,813,189		175,200			11,250
Corps of Engineers	Hydro	1,806,400	458,000	631,000	536,000	412,000	1,604,000
Total	Hydro	3,111,500	458,000	806,200	536,000	412,000	1,615,250
Pacific Total All Agencies	Hydro	9,822,815	543,000	979,200	705,200	442,000	3,784,750
	Steam	5,406,250	1,075,500	706,000	420,000	196,000	236,000
	IC	50,496					
	Total	15,279,561	1,631,200	1,685,200	1,125,200	638,000	4,020,750
U. S. Possessions							
Bureau of Reclamation Alaska	Hydro	15,000	15,000	15,000			
Fairbanks, Alaska	Steam	8,500	5,000				
Kodiak, Alaska	IC	2,010	650			650	
Hawaiian Electric Co	Steam	237,500	50,000				50,000
Maui Electric	Hydro	75					
	Steam	21,500	11,500				
	Total	21,575	11,500				
Puerto Rico Water Resources Authority	Hydro	86,500	8,000	20,000			
	Steam	121,000			40,000	40,000	40,000
	Total	207,500	8,000	20,000	40,000	40,000	40,000
Virgin Islands Power	Steam						1,250
	IC	6,145	1,250	1,000			1,000
	Total		1,250	1,000			2,250
U. S. Possessions Total	Hydro	101,575	23,000				
	Steam	388,500	66,500		40,000	40,000	91,250
	IC	7,165	1,900	1,000	650	650	1,000
	Total	497,240	91,400	21,000	40,650	40,650	92,250
Canada—Key Main Units							
Brandbridge, Ontario	Hydro	2,000		1,000			
British Columbia Electric Co	Hydro	606,200	50,000		42,000	50,000	50,000
	Steam	12,444					
	IC	1,580	125				
	Total	620,224	50,125		42,000	50,000	50,000
British Columbia Power Commission	Hydro	185,000		45,000	50,000	25,000	
	IC	30,000	5,000	3,540			
	Total	215,000	5,000	48,500	50,000	25,000	
Calgary Power Ltd	Hydro	162,000†	40,000†	19,000†			
	Steam				66,000†		
	Total	162,000†	40,000†	19,000†	66,000†		

Tempe Valley	Hydro	5,250						
	Steam	5,250			7,500			
	Total	10,500			7,500			
Total	Hydro	5,400		150		1,000		500
	Steam	38,500	33,000		7,500	16,500		16,500
	Total	43,900	33,000	150	7,500	17,500		17,000
Federal Agencies								
Bureau of Reclamation	Hydro	702,150	138,081	36,000	28,500	195,460		100,700
Corps of Engineers	Hydro	85,000		60,660				69,000
Total	Hydro	787,150	138,084	96,000	28,500	195,460		270,700
Mountain Total All Agencies	Hydro	1,992,902	329,034	29,100	179,500	196,460		1,013,200
	Steam	1,462,544	885,200	866,500	168,875	250,000		209,500
	IC	48,472	207	1,000				
	Total	3,414,842	525,334	446,600	343,375	606,460		1,302,700
Pacific								
Power Companies								
California Electric Power	Hydro	67,870						
	Steam	109,000		66,000				60,000
	IC	235						
	Total	156,000		66,000				60,000
California Oregon Power	Hydro	223,670		20,000	30,000			650,000
	Steam	3,000						
	Total	226,750		20,000	30,000			650,000
Pacific Gas & Electric	Hydro	1,256,300	3,500	80,000				900,500
	Steam	2,730,800	600,000	240,000	200,000			
	Total	4,087,100	603,500	234,000	200,000			900,500
Pacific Power & Light	Hydro	238,376						
	Steam	87,800	3,500					
	IC	5,900						
	Total	332,076	3,500					
Portland General Electric	Hydro	121,823	14,000					
	Steam	88,000						
	Total	209,823	14,000					
San Diego Gas & Electric	Steam	387,000	100,000		100,000			
Southern California Edison	Hydro	943,220			10,000			
	Steam	1,035,750	147,000	160,000	320,000			
	IC	30,000						
	Total	2,008,970	147,000	160,000	330,000			
Total	Hydro	2,930,939	17,500	113,000	43,000			1,449,500
	Steam	4,438,350	850,500	264,000	620,000			60,000
	IC	37,200						
	Total	7,406,529	868,000	467,000	663,000			1,509,500
Municipal, State and Power District Systems								
Glendale, Cal.	Steam	80,000						20,000
Los Angeles, Cal.	Hydro	733,000			3,000			
	Steam	631,000	200,000	312,000		156,000		156,000
	Total	1,364,000	200,000	312,000	3,000	156,000		156,000
Pasadena, Cal.	Hydro	11,000						
	Steam	90,000		60,000		60,000		
	Total	101,000		60,000		60,000		
Imperial Irrigation District	Hydro	84,000			35,000			
	Steam	25,000						
	IC	12,676						
	Total	97,676			35,000			
Turlock Irrigation District	Hydro	22,000						20,000
Eugene, Oregon	Hydro	23,000				30,000		
	Steam	25,000						
	Total	48,000				30,000		
Chelan County P.U.D.	Hydro	167,000						165,000

Canadian Utilities	Steam	32,750				17,500		
	IC	5,125	1,500	1,500		2,250		
	GT	9,375	9,375					
	Total	47,250	19,875	1,500		19,750		
Gaspe South Electricity Corp.	Hydro			4,500				
	IC	3,650						
	GT							
	Total	3,650		4,500				
Gatineau Power Co.	Hydro	267,630‡		47,000‡				
Great Lakes Power Co.	Hydro	114,550	10,000				25,500	
Hydro-Electric Power Commission of Ontario	Hydro	3,201,100	640,500	402,500	77,500	155,000		960,000
	Steam	714,000						
	IC	3,000						
	Total	3,919,000	640,500	402,500	77,500	155,000		960,000
Lower St. Lawrence Power Co.	Hydro	11,000			10,000			
	IC	5,250						
	Total	16,250						
Manitoba Hydro-Electric Board	Hydro	448,000	34,000	34,000				
	Steam				55,000	55,000		
	Total	448,000	34,000	34,000	55,000	55,000		
New Brunswick Electric Power Commission	Hydro	93,700						80,000
	Steam	90,400			23,529			
	IC	6,160						
	Total	130,310			23,529			80,000
Newfoundland Light & Power Co	Hydro	43,500						
	Steam				11,000			22,000
	IC	2,500						
	Total	46,000						
Northern Quebec Power Co.	Hydro	76,320		42,500				
NW Territories Power Commission	Hydro	10,000					3,000	
	IC	457					500	
	Total						3,500	
Nova Scotia Light & Power Co & Subsidiaries	Hydro	85,776	8,500					
	Steam	62,050		29,412			58,000	58,000
	IC	2,400						
	Total	110,206	8,500	29,412			58,000	58,000
Nova Scotia Power Commission	Hydro	70,000		3,000			4,500	
	Steam	26,125		20,000				20,000
	IC	2,275						
	Total	98,675		23,000			4,500	20,000
Quebec Hydro Electric Commission	Hydro	1,377,000	36,000	15,000	255,000	360,000		360,000
Regina, Saskatchewan	Steam	55,000		30,000				
Saskatchewan Power Corp.	Steam	139,100†	45,000†		63,000†			
	IC	20,500†	2,500†	3,000†	3,000†	3,000†		
	Total	159,600†	47,500†	3,000†	66,000†	3,000†		
Shawinigan Water and Power Co	Hydro	1,207,250		142,000				
United Towns Electric Co.	Hydro	10,480			5,000			
	IC	510						
	GT							
	Total	10,960			5,000			
Winnipeg Hydro Electric System	Hydro	160,000						
	Steam	51,000	25,000†					
	Total	214,329	25,000†					

Source: "Electrical World" Survey. Unless otherwise noted, year end 1954 capacity is reported as nameplate, additions are reported as maximum rated capability. ‡(Canada) Kw. †(Canada) HP.

REA

REA UPS CAPACITY SPENDING IN 1954

Last year more money was spent on generating and transmission facilities than is usually the case for the REA-financed systems. The result was that year-end capacity and generation figures show substantial gains over 1953.

Of the total 18.8 billion kwhr system input, REA systems themselves produced about 14½% of the total, 2,712 million kwhr, purchasing the remainder. This was a 29% increase over system generation in 1953 slightly raising the ratio of self-generated to purchased power.

Capacity additions amounted to almost 202,000 kw during 1954 bringing total generating plant capacity to 880,000 kw, for an increase of almost 30% in total installed capacity.

An increase of $168 million in loans approved brought the year-end cumulative figure to $2,946 million. About 75% of this was apportioned to distribution lines while generation and transmission facilites accounted for almost all the remainder.

A total of 39,000 distribution lines were added during the year, down considerably from the 53,000 added during 1953. Part of this new construction went to serve the 152,000 new customers the systems added. Average usage per customer was up over 500 kwhr pushing the total past the 4,000 kwhr mark to 4,031 kwhr.

Statistic of REA - Financed Systems

	1952	1953[1]	1954[1]
CUMULATIVE YEAR-END DATA			
Total Loans Approved	$2,668,946,121	$2,778,136,191	$2,946,000,000
Distribution Lines	$2,137,839,562	$2,251,886,542	$2,379,000,000
Generation and Transmission	$ 506,394,794	$ 505,289,886	$ 541,000,000
Consumer Facilities	$ 24,711,765	$ 20,959,763	$ 23,000,000
Funds Advanced	$2,157,945,900	$2,339,965,707	$2,524,000,000
Systems in Operation	1,020	1,022	1,025
Miles of Line in Operation	1,244,645	1,297,264	1,336,000
Consumers Connected	3,858,396	4,024,826	4,176,000
Systems Generating Power During Year	90	89	83
Generating Capacity—kw	571,901	678,304	880,000
ANNUAL DATA			
Energy Generated—kwhr	1,639,847,821	2,103,446,229	2,712,000,000
Energy Purchased—kwhr	11,757,006,801	13,737,813,667	16,108,000,000
Total System Input—kwhr	13,396,854,622	15,841,259,896	18,820,000,000
Energy Sold—kwhr	11,534,359,190	13,755,493,788	16,525,000,000
Operating Revenues	$ 321,407,348	$ 362,977,101	$ 413,600,000
Operating Deductions Totals	$ 263,482,898	$ 296,653,728	$ 331,800,000
Cost of Power[2]	$ 106,417,172	$ 121,926,707	$ 140,600,000
Distribution Expenses—Operations	$ 25,070,571	$ 28,233,079	$ 30,500,000
Distribution Expenses—Maintenance	$ 13,547,486	$ 14,836,059	$ 16,300,000
Consumers Accounting & Collecting	$ 12,527,650	$ 13,569,097	$ 14,600,000
Administration & General Expenses	$ 28,791,864	$ 32,460,031	$ 34,300,000
Other Operating Expenses	$ 3,942,361	$ 4,433,827	$ 4,800,000
Depreciation	$ 63,347,242	$ 70,091,242	$ 77,500,000
Amortization of Intangibles, etc.	$ 841,948	$ 991,510	$ 1,200,000
Taxes	$ 8,996,604	$ 10,112,176	$ 11,800,000
Utility Operating Margin	$ 57,924,450	$ 66,323,373	$ 81,800,000
Non-operating Margin	$ 1,255,372	$ 2,219,455	$ 2,900,600
Interest on Long Term Debt	$ 35,194,683	$ 38,060,539	$ 41,800,000
Interest Charged to Construction Cr	$ 1,017,968	$ 832,398	$ 400,000
Other Deductions	$ 454,738	$ 485,873	$ 600,000
Net Margin	$ 24,548,369	$ 30,828,814	$ 42,700,000
PAYMENTS TO GOVERNMENT—CUMULATIVE DATA			
Interest Due	$ 140,829,058	$ 163,617,881	$ 192,800,000
Interest Paid	$ 140,539,059	$ 163,484,884	$ 192,500,000
Principal Due	$ 202,040,549	$ 243,739,286	$ 295,500,000
Principal Paid	$ 254,727,884	$ 307,495,236	$ 376,400,000
Overdue Amounts (more than 30 days)	$ 718,399	$ 355,592	$ 312,000
Interest	$ 135,100	$ 36,659	$ 57,000
Principal	$ 583,299	$ 318,933	$ 255,000
Advance Payments of Principal	$ 52,470,962	$ 62,496,021	$ 79,000,000

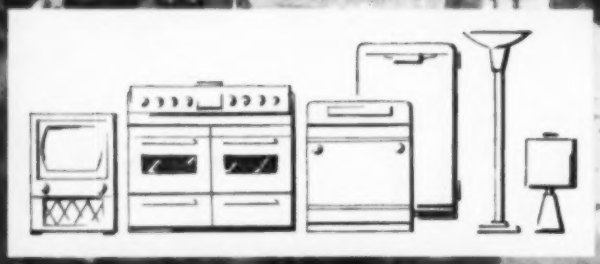
Source: Monthly Operating Reports of Rural Electrification Administration borrowers and reports of the Rural Electrification Administration.

[1] Preliminary.
[2] Based on (9) nine months actual data and one (1) to three (3) months estimated.
[3] Cost of Power includes cost of purchased power and prime costs incurred in the production and transmission of generated energy.

General Electric Announces...
GENERAL ELECTRIC
SINGLE-PHASE WATTHOUR METER
TYPE I-55-S
KILOWATTHOURS
15 AMPERES
240 VOLTS
3 WIRE
Kh 3.6
60 CYCLES
Kh 27½
MODEL AR1
•34 904 235
Newest member of the I-50 Meter Family...

1955

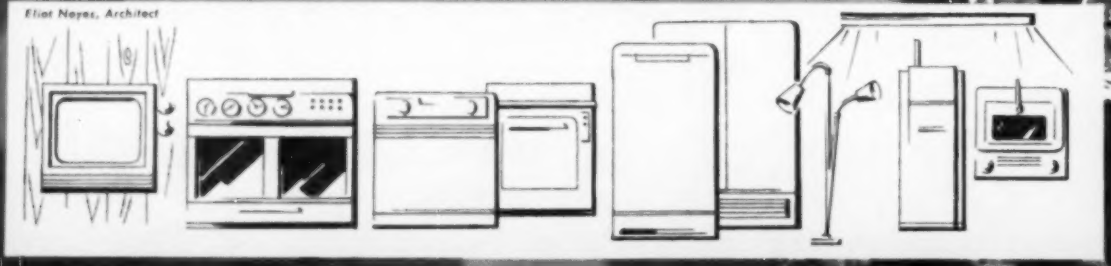
Present-day meters handle residential loads ranging up to 30-40 amperes. In next ten years, this will be greatly increased.



1965

Loads will more than double. New appliances will necessitate new meters like the G-E I-55 meter, capable of measuring up to 100 amps.

Eliot Noyes, Architect



NEW General Electric I-55 Watthour Meter Offers Straight-line Accuracy up to 100 Amps

New meter, designed for future loads, retains all the features of the proven I-50 meter family

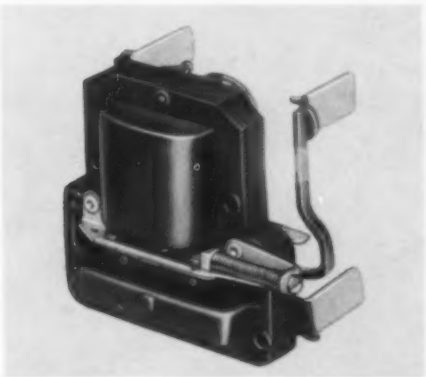
General Electric's newest addition to the I-50 meter family, the 15-ampere I-55 watthour meter, combines straight-line accuracy up to 100 amps with all of the proven features inherent in each I-50 design.

Designed for the increasing loads of the future, the new I-55 meter is *factory certified* for accuracy and performance . . . offering you the same dependability and savings so long associated with the original I-50 meter.

All of the outstanding qualities of the established I-50 family have been retained in the new G-E meter: rigid unit construction of all parts, magnetic suspension of the rotor, unique retarding system, highly legible registers. These cost-saving features have been proven by the more than five million I-50 meters in service today. For more information on the new I-55 meter, write for the new descriptive bulletin "G-E I-50 Meter Family," GEA-6071 to: Section 621-1, General Electric Company, Schenectady 5, N. Y.

I-50 METER FAMILY . . . DESIGNED TO LOWER YOUR METERING COSTS

MAGNETIC SUSPENSION system eliminates bearing wear, keeps maintenance cost to a minimum.



UNIQUE STATOR DESIGN of unit construction eliminates any changes in calibration. Butyl-molded current coil assures accurate, reliable operation.

INCREASED LEGIBILITY is assured in both the low-friction cyclometer and pointer-type registers.

Progress Is Our Most Important Product

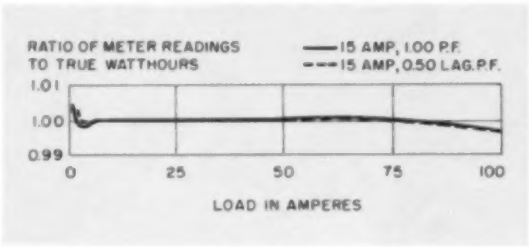
GENERAL ELECTRIC

New G-E I-55 Watthour Meter...

STRAIGHT-LINE ACCURACY UP TO 100 AMPS

Capable of accurately measuring loads up to 100 amperes, the new G-E meter has been designed to accommodate the projected doubling of loads in the next ten years.

With this straight-line accuracy, the I-55 meter offers greater versatility, longer life, more economical operation.



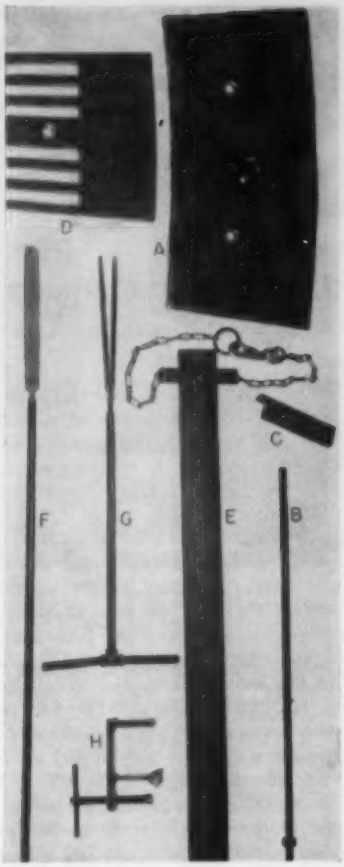
FACTORY CERTIFIED FOR ACCURACY AND PERFORMANCE

The new I-55 meters offer *certified* accuracy and *certified* performance.

The gold seal of certification is your assurance that each General Electric I-55 meter has met the rigid, quality-control standards and is factory certified . . . your key to lower metering costs.

Progress Is Our Most Important Product

GENERAL ELECTRIC



SPECIAL TOOLS reduced down time 20 days during rewinding of a 65-Mw generator

Rewinding Time for Generator Cut 20 Days with Special Tools

W. F. GRAUCH, Asst to General Superintendent, Niagara District, Niagara Mohawk Power Corp, Niagara Falls, N. Y.

Restacking and rewinding a burned-out 65-Mw generator stator using new tools and methods reduced "down time" to 68 days and saved Niagara Mohawk Power Corp about 20 days. Moreover, the tools permitted installation of an additional four tons of stator iron in the original space, thus decreasing losses.

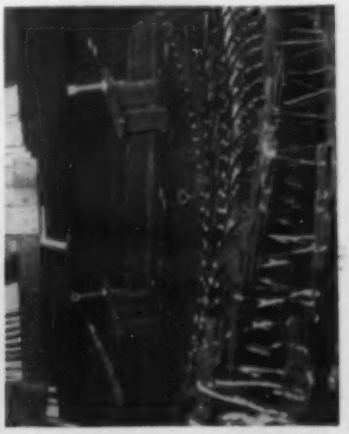
The burnout occurred in a 65-Mw, 12-kv, 25-cps, 107-rpm generator at Schoellkopf Station. Some laminations were damaged, and this required restacking all but 20 in. of iron. However, most of the iron was straightened and reused.

During restacking every 16 or 17 in. of laminations were compressed with special clamps comprising 28 steel plates, 56 ⅞-in. by 8-ft threaded rods, and 56 stop plates (items A, B, and C in illustration). The plates were placed on laminations and drawn down with the threaded rods attached to the stop plates, which fitted into coil slots under the bottom fingers.

At first, compressing was done by tightening each nut with a box wrench and pounding on the plates. This method was discarded in favor of air-powered impact wrenches, which controlled compression better, improved safety, and conserved energy of workmen.

To dress the laminations slotted plates (item D) were bolted to the

BOTTOM RING made of channel iron and wood maintained uniform coil height



TOP COIL SIDES were seated with a steel bar and three specially designed clamps

iron. Hardened steel bars (item E) were then driven into the slots for initial smoothing. Finished smoothness was obtained by filing with a pair of 14-in. coarse bastard files welded to conduit (items F and G). A total of 12 slotted plates were used to speed the dressing operation.

During installation of the stator coils uniform height was maintained by a channel iron and wooden T-block mounted on brackets around the bottom of the frame. This provided a "seat" for the coils to rest upon.

Bottom coil sides were pressed solidly into place with a long steel base plate that slipped into the slot. Pressure was applied to the full slot length of the coil by driving together a pair of hard maple wedges having a waxed edge and tapered about 2½ in. per 9 ft.

Top coil sides were seated by the use of a similar steel bar and three clamps (item H). Clamps were slipped into the adjacent wedge slot and screw pressure applied. Counter pressure was levered and absorbed in the core iron.

Series-Circuit Tool Cuts Lamp Replacement 50%

E. W. McCALL, Meter Engineer, South Carolina Electric & Gas Co, Charleston, S. C.

A tool for safe and accurate checking of current settings in series street light circuits has cut South Carolina Electric & Gas Co's lamp replacements over 50%. Moreover, considerable time is saved as two men in 10 min can now do the testing job formerly requiring three men about four hours.

To make the 18-lb series-circuit tester one end of a standard hot stick was turned down, and the base of an old street light bulb mount was mounted on it. This end of the stick was also drilled and grooved for wire connections to the light bulb base. A standard street light socket with a sandwich in place was then screwed to the base.

The base was connected by 5-kv conductors to a 2.5-kv, two-to-one ratio current transformer that was mounted as far down the stick as practical for ease of handling. On the secondary side of the CT a 5-amp ammeter was mounted in a wooden box having a removable cover for protection. The meter has a 10-amp scale to provide direct reading and is marked with a red line above the 6.6-amp scalar division.

Use of this tool replaced a checking method that required two linemen and a helper to temporarily cut a current transformer into the circuit. This method proved so cumbersome that circuits were being adjusted with clamp-on ammeter, which was not sufficiently accurate.

CHECKING CURRENT SETTING of a series street light circuit is speeded by using a specially developed series-circuit ammeter

With the new tool all circuits in the Charleston area were checked by a lineman and driver, and a large percentage were found on the high side. Accurate resetting of the supply transformers has reduced lamp replacements over 50%. The device has proved so easily used that a regular schedule was established for night servicemen to check all circuits periodically.

"Runners" Protect Portable Substations in Transit

W. R. HECHT and F. W. NEWELL, Substation Dept, Indiana & Michigan Electric Co, Fort Wayne, Ind.

Detachable "runners" are placed atop portable substations to protect exposed high-voltage air-break switches and lightning arresters from damage transit. Otherwise the equipment can be damaged when passing branches, telephone service, and other overhead obstructions.

Runners are made of ¾-in. steel rod with suitable brackets that may be attached or detached in 5 or 6 min by one man. They are not depended upon to raise heavy tree limbs during transit, but have saved considerable time and damage while passing under small limbs.

(More How To on page 182)

G.E. designs light, compact, 5 KV current transformer with high resistance to corrosion

One third smaller and lighter, the new butyl-molded, outdoor, Type JKW-3 transformer is easier to install and maintain.

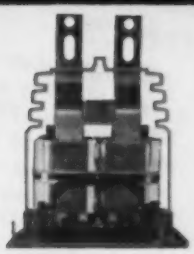
Almost completely corrosion-proof, this new General Electric current transformer is the first butyl-molded transformer designed for 5000-volt outdoor application. This revolutionary design has virtually eliminated maintenance.

CORROSION-RESISTANT materials are used in all exposed metal parts. The case and primary bushing are butyl rubber. The butyl also serves as insulation and as an important factor in the new Type JKW-3's high mechanical strength.

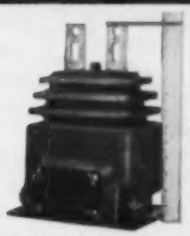
EASIER TO INSTALL, this new G-E current transformer can be mounted in any position for bottom-, side-, or top-connected installations. The lightweight and smaller size facilitates installation and handling.

ACCURACY CLASSIFICATION of the Type JKW-3 transformer is 0.3 at burdens: B-0.1 to B-2.0. Ratings are from 10 to 800 amperes.

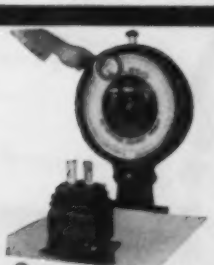
FOR MORE INFORMATION, contact your nearest G-E Apparatus representative, or write for Bulletin GEC-1222 to: Section 604-40, General Electric, Schenectady 5, N. Y.



1 BUTYL-MOLDED



2 COMPACT
only 12¾ in. high



3 LIGHTWEIGHT
only 42 lbs.

GENERAL ELECTRIC

EDITORIALS

Control of Residential Loads

"To everything there is a season and a time for every purpose under the heaven."

This quotation from the Bible—Ecclesiastes, chapter 3, verse 1, if you want to check it—expresses the thinking of Electrical World in respect to control of residental loads. We believe that the season is past for control of electric water heating and that the season is here for considering control of radiant or other resistance type electric house heating, assuming that it is possible.

The number of electric water heaters now in use in this country is about 6.5 million, about 15% saturation (EW, Jan. 25, p 232). The diversified demand per heater in uncontrolled operation declines consistently, irrespective of tank sizes and wattages, as the number of heaters increases up to 1,000 in a group (EW, Nov. 23, 1946). Possibly it would continue to decline if the grouping were carried above 1,000, but we have no evidence for that. In 1930, the late Harry Snow, then controller of the Detroit Edison Co, said in Electrical World, "It makes only a little difference at the power house whether high-wattage or low-wattage heaters are used."

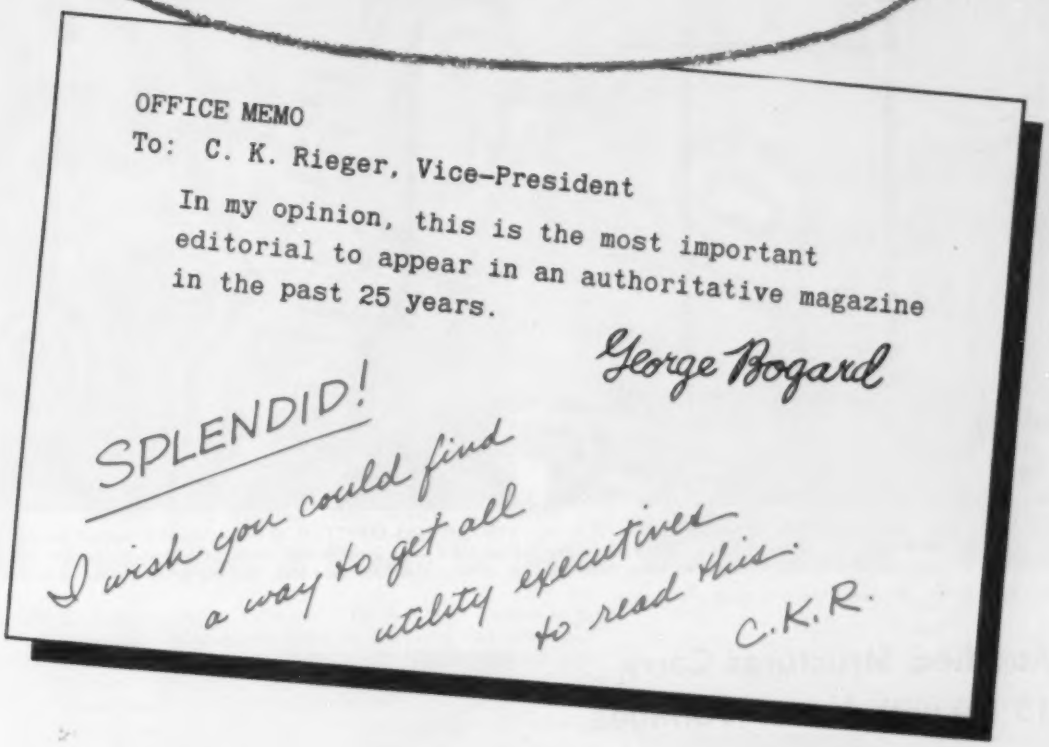
These three references add up to a two-part idea. First is the thought that every electric utility that really has been promoting the load must have enough water heaters on its lines that the bug-a-boo of high demand, scaring many away from uncontrolled operation, has just quietly evaporated. The second thought is that if there were little to choose at the power plant between high and low-wattage heaters in 1930 when average annual residential usage was 547 kwhr and if it is assumed that increase in distribution capacity has kept up pretty well with growth of usage to around 2,500 kwhr today, then the need for concern about wattage of water heaters has also evaporated. Which is to say that we think the water heater load is now grown up and can safely be freed from any control.

When the water heater was new in the electric appliance scene, its annual usage of 3,000 kwhr or more towered high above the then average residential usage of 300 kwhr or less. The disparity struck terror into the minds of utility management. Obviously the monster must be controlled if it was to be coaxed into the family of electric service. The then situation of the water heater load is paralleled today by that of the electric house heating load—2,500 kwhr residential average as against 12,000 kwhr and up for heating. The same need exists for control of the new load at least until its characteristics are firmly established when, if its nature permits and increase of system facilities has kept pace with its growth, it can be set free.

There was question as to the practicability of control of the water heater load. The same question arises in respect to house heating, particularly where there is no offsetting summer air conditioning. It took a long time and a lot of investigation and argument to settle the question as it concerned the one load. The industry cannot get started too soon towards settling it in terms of the other.

For every Utility Executive . . .

here's the most important piece of reading in 25 years!


OFFICE MEMO
To: C. K. Rieger, Vice-President
In my opinion, this is the most important editorial to appear in an authoritative magazine in the past 25 years.
George Bogard
SPLENDID!
I wish you could find a way to get all utility executives to read this.
C.K.R.

General Electric's NEW Water Heater says: "AMEN"!

The G-E Quick-Recovery Water Heater, with 40-gallon tank and two 4,500-watt interlocked elements, has ALREADY been approved without restriction by electric utilities representing almost one-quarter of the residential customers in the U.S.

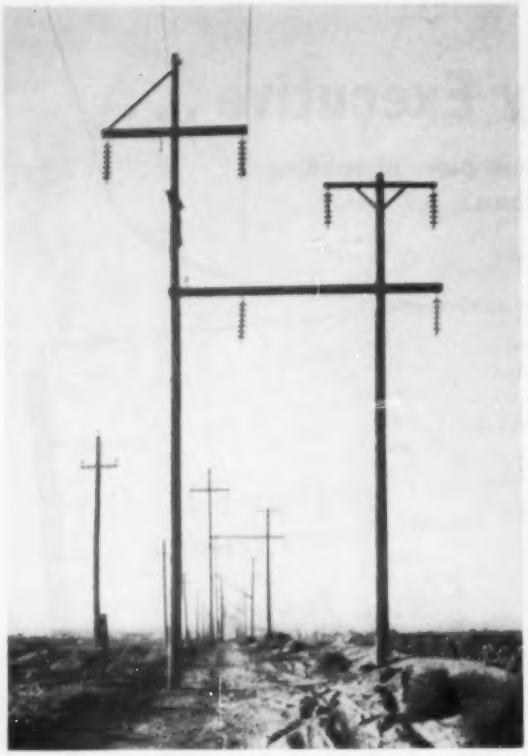
This G-E Heater has daily load characteristics that are of great advantage to ANY public utility with a rapidly growing air conditioning load. Furthermore, *electric water heating complements air conditioning* to a great degree on a seasonal basis . . . improves system load factor . . . builds return on investments.

Increased electric-utility acceptance of this G-E One-Design Electric Water Heater will make it possible to compete easily with flame types on FIRST PRICE . . . and on PERFORMANCE.

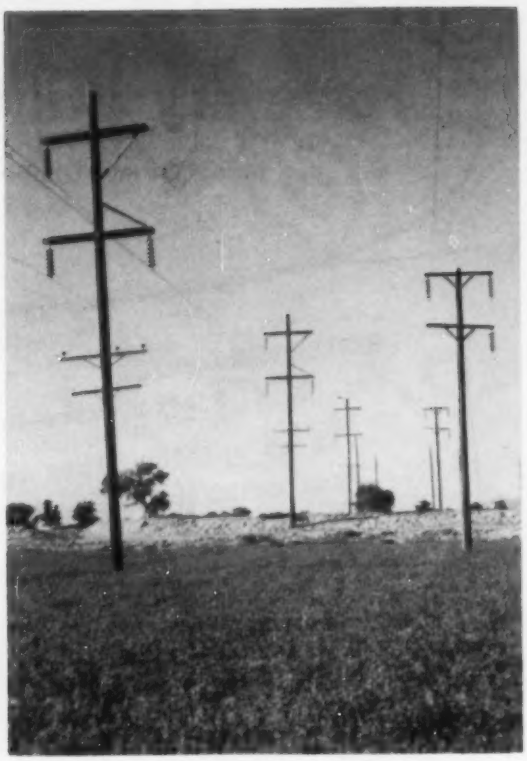
For detailed information, please write Mr. G. T. Bogard, Manager Utility Relations.

Major Appliance Division • Appliance Park, Louisville 1, Ky.

GENERAL ELECTRIC



TWO-POLE STRUCTURE on the 50-ft right-of-way carries 115 kv in the middle and 66 kv at right. Crossarm keeps poles from swaying independently. Line used 97 of these structures. At left is 24-kv line



NEW ONE-POLE STRUCTURE at left on the 50-ft right-of-way combines 115 kv with 24 kv in the center and 4 kv on the bottom. Over 90 of these structures were used. At right is the original 66-kv line

Modified Structures Carry 115 Kv with Lower Voltages

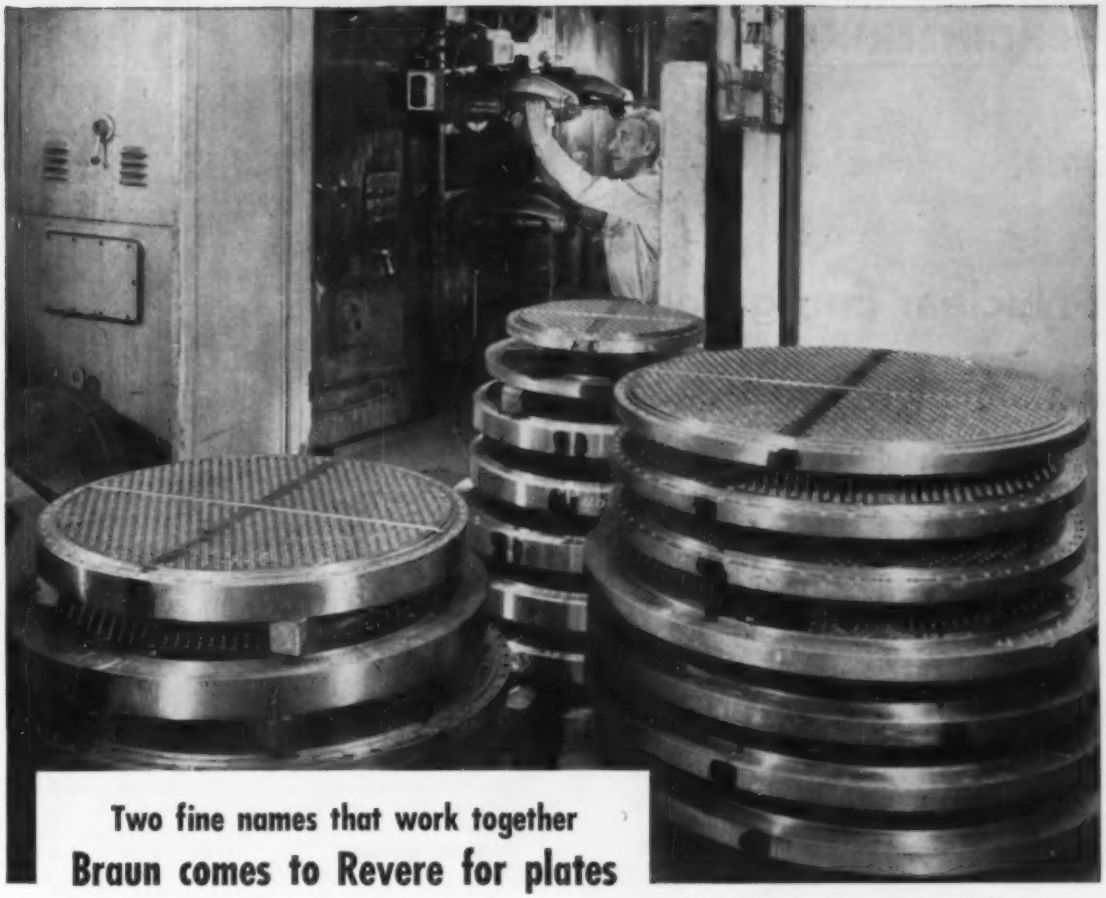
Ten different types of H-frame and one-pole construction helped El Paso Electric Co add a 115-kv circuit onto a right-of-way which varied from 40 to 50 ft in width and already was carrying a 66-kv line and a 24-kv line. The three most typical of the ten structures are shown in accompanying illustrations.

Unusual structures and line configurations were required to provide necessary clearances. Spans in the 39-mile line are normally 10 or 20 to the mile, with 10 spans per mile where 115-kv circuit is above 66-kv line and 20 spans where 24-kv line is combined with 115 kv on the same structure. For a short distance voltages of 115 kv, 24 kv and 4.16 kv are on the same structure. A total of 711 pine poles were used. Although some 75-ft poles were necessary, the majority are 60 and 65-ft long.

Designed to carry 35,000 kw at 115 kv, the line has phase wires which are 3/0 hollow conductors with 19 strands, 7 hollow and 12 solid. This type was chosen to reduce radio interference, lessen flashovers in an area having about 20 lightning storms per year, and cut corona losses at the operating altitude of over 4,000 ft. Overhead shielding is provided by one steel guy strand attached to a ground wire at each 115-kv structure. Ground wire clears all hardware and is wrapped around pole butt.

(More How To on page 186)

H-FRAME STRUCTURE plus a crossarm carries 115 kv and 24 kv on a 40-ft right-of-way. Alternate 24-kv poles of the old line were left in place. H-frames of this type totaled 64. At left is the 66-kv line



Tube sheets at 4-spindle automatic drill in Braun shop.

Two fine names that work together

Braun comes to Revere for plates

C. F. Braun & Co., Alhambra, Calif. is well known in the petroleum industry, the chemical industry, and other businesses in which heat transfer and fractionation are vital. Revere Copper and Brass Incorporated is well known in the non-ferrous metal industry for its tube sheets and plates, in all the customary alloys. What is more natural than the close relations between the two companies, Revere the supplier, Braun the fabricator? Revere can furnish heavy plates when needed; Braun is one of the great heavy-duty shops of the country. So far as transportation limits permit, Braun fabricates in its own plant; their machines and their cranes can handle anything the railroads can haul away. The same is true of Revere, which is likewise known throughout heavy industry for its ability to produce not only large plates, but also condenser and heat exchanger tubes.

Revere is pleased to be an important supplier to Braun. Remember, good names find it good business to come together. The next time you want quotations on tube sheets and plates, and condenser tubes, get in touch with the nearest Revere Sales Office.

A Braun engineer inspects a drilled tube sheet.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y. Sales Offices in Principal Cities, Distributors Everywhere.

Nuclear Energy on Share-the-Expense

Modern estimates of nuclear-energy plant and generation costs have moved toward definite values.

Accompanying data are derived from a presentation by John W. Landis of The Babcock & Wilcox Co at a session (July, 1954) of the Atomic Industrial Forum, Inc.

These are based on a 200,000-kw plant, 16% fixed charges on utility investment, 7,000-hr annual operation. All fuel consumptions are expressed per million kwhr. The values for natural and enriched uranium and plutonium used in the calculations are unofficial but are values which have been mentioned from time to time by Dr. L. R. Hafstad as being useful for long-range estimating purposes.

Despite prodigious efforts already put into the technical aspects of nuclear power by government and industry, the view ahead is by no means clear. A haze of unsolved development problems permits only a fuzzy estimate of the cost scale lying on the horizon.

Table 1. Financial Data

Item	Conventional Plant	Nuclear Plant
Construction Cost, Utility	$26,000,000	$44,000,000
AEC*		16,000,000
Dollars Outlay, Total $/kw	130	300
by AEC*		80
by Utility		220
Fixed Charges, mills/kwhr	3.0	5.0
Labor and Maintenance	0.5	1.0
Fuel	3.0	0.2
Total Energy Cost, mills/kwhr	6.5	6.2

*AEC allotment to Research and Development

Table 2. Uranium Fuel Costs (1,000,000 kwhr)

Item	Pounds	$/lb	Mills/Kwhr
Source Material, Natural Uranium	85	20	1.7
Special Material, Enriched Uranium	0.2	9,000	1.8
AEC Charge for Use of Special Material			0.1
Fuel Fabrication Cost			0.2
Freight (New and Used Fuel)			0.1
Separation Expense			0.5
			4.4
AEC Credit for Used Fuel Elements			
Plutonium Content	0.4	10,000	4.0
Depleted Uranium			0.2
			4.2
Net Fuel Cost			0.2

Table 3. Uranium and Plutonium Quantities (per million kwhr)

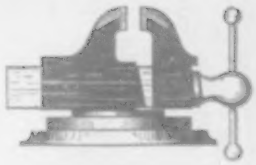
Fuel (U-235) Consumption Rate per million Btu	=0.000031 lb
Heat Rate	=16,000 Btu/kwhr
Corresponding Thermal Efficiency	=21.3%
U-235 per million kwhr	0.5 lb
40% from enriched uranium	0.2 lb
60% from natural uranium	0.3 lb
(Above based on 1.2% average feed enrichment)	

Since 4,000 MWD irradiation leaves half of the U-235 in the natural uranium, the amount purchased for replenishment would be (with 0.007115 enrichment):

$$\frac{2\times 0.3}{0.007115} = 85 \text{ lb per million kwhr}$$

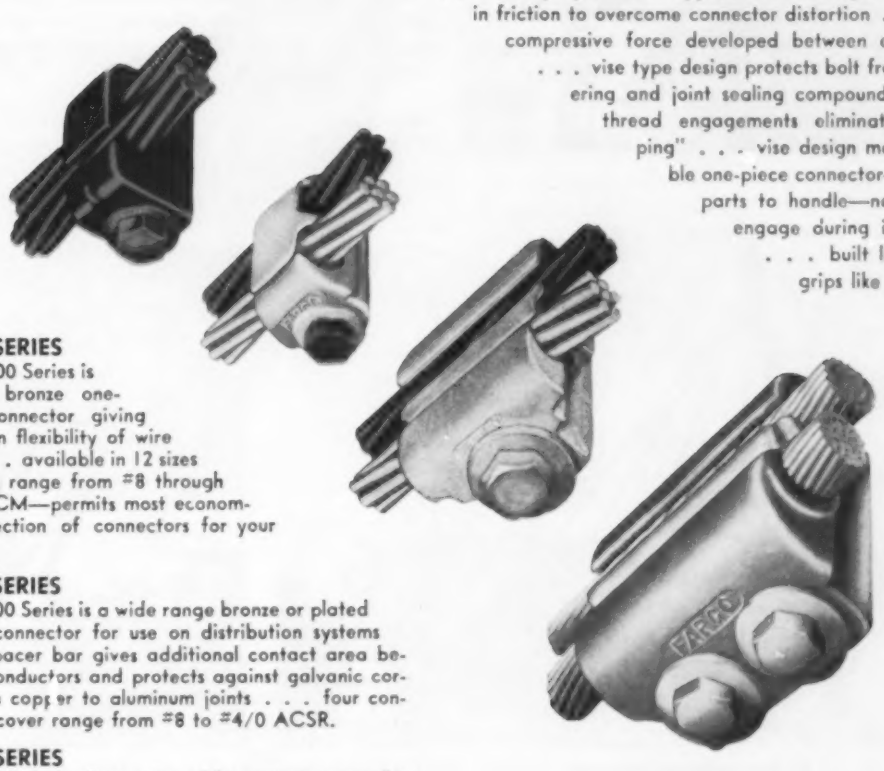
with an 0.8 conversion ratio, the 0.5 lb of U-235 consumed per 1,000,000 kwhr would result in 0.4 lb of plutonium.

ALL FARGO CONNECTORS* are "VISE-TYPE"



VISE TYPE?

. . . small proportion of applied wrench torque dissipated in friction to overcome connector distortion . . . high compressive force developed between conductors . . . vise type design protects bolt from weathering and joint sealing compounds — long thread engagements eliminates "stripping" . . . vise design makes possible one-piece connector—no loose parts to handle—no parts to engage during installation . . . built like a vise, grips like a vise.



5000 SERIES

. . . 5000 Series is a cast bronze one-piece connector giving maximum flexibility of wire sizes . . . available in 12 sizes covering range from #8 through 1000 MCM—permits most economical selection of connectors for your system.

8000 SERIES

. . . 8000 Series is a wide range bronze or plated bronze connector for use on distribution systems . . . spacer bar gives additional contact area between conductors and protects against galvanic corrosion in copper to aluminum joints . . . four connectors cover range from #8 to #4/0 ACSR.

9000 SERIES

. . . 9000 Series has extra wide contact areas for maximum conductor encirclement . . . well rounded corners minimizes danger of nicking conductor.

. . . thick, pure aluminum spacer when under pressure forms around the strands of conductor sealing out moisture or other corrosive media—reduces danger of electrolyte bridging gap between copper and aluminum conductors.

. . . cast in aluminum . . . available to handle aluminum to aluminum or aluminum to copper connectors from #8 through 500 MCM . . . plated connectors of same design are available for all purpose use.

Ask your Line Material Field Engineer for complete details.

* Patented

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

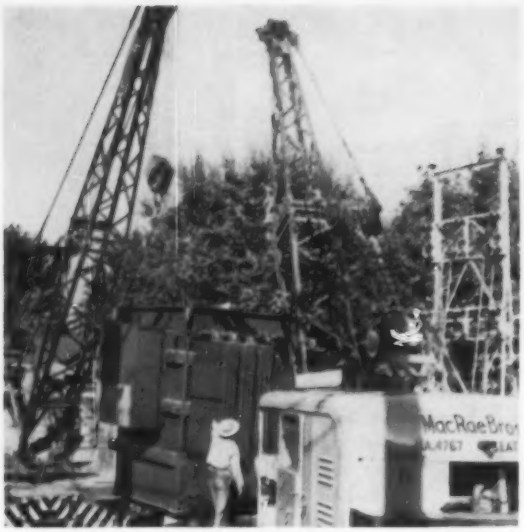
Poughkeepsie, N. Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin



Cranes Speed Over and Under Transformer Move

Setting a 40-ton transformer at a substation site located in a hollow with two mobile cranes saved Seattle City Light up to three working days. Although the transformer had to be carried downhill and lifted over a fence, the move took a little more than an hour.

The transformer was placed on a site 20 ft below street level and adjacent to an energized substation. Two 30-ton cranes did the job in three lifts, working under the obstacle of overhead cables. If the cables and fence had not been present, only one lift would have been required.

Had the transformer been moved on rollers by block and tackle, a 75-ft ramp down the hill would have been required, as well as two 90-deg turns. It is estimated this method would have taken three days.

TWO CRANES move 40-ton transformer 20 ft downhill in an hour. In three lifts the unit was moved under cables and over a fence

PULLING POLES can be done quicker and easier with a hydraulic derrick. Precision control and center leg to take the strain during pulling operations are especially valuable when poles must be set between or removed from between wires of a high-voltage circuit

HYDRAULIC DERRICK truck is particularly valuable in downtown areas because its operations can be controlled precisely

Hydraulic Derrick Trucks Are Time Savers

A. J. DIEWALD, Superintendent of the Line Dept, Toledo Edison Co., Toledo, Ohio

Hydraulic derrick trucks are saving many man hours for Toledo Edison Co. The first unit was purchased on a fingers-crossed basis. It proved to be such a time-saver that a second unit was purchased, and already two additional units have been ordered. The first two were two cylinder units. Those on order are four-cylinder units.

Some of the jobs for which they have proved particularly valuable are:

1. Removing slabs on underground vaults, and reinstalling them.
2. Erection of ornamental street lighting standards.
3. Loading heavy materials, such as transformers and reels, into truck.
4. Setting and moving poles.

When removing or installing slabs on underground vaults, the hydraulic derrick truck substitutes for the truck crane to the extent of its capacity. The truck crane is a much more expensive piece of equipment and costs more to move to and from the job.

Chief advantage of the hydraulic derrick truck over the truck with conventional boom is the time of erecting

(Continued on page 190)

America's Finest Suspensions...

THANKS TO VICTOR "KNOW-HOW"

and Purified Porcelain!

VICTOR No. 900
SUSPENSION

Every VICTOR Suspension insulator is the result of sound design, superior craftsmanship and VICTOR *Purified* Porcelain—finest insulator porcelain ever made! That's why they have improved thermal resistance, better mechanical and electrical characteristics and greater resistance to impact. Thanks to VICTOR's unique "know-how," you just can't buy a better suspension!

For the full facts on Victor "Know-how," write for "The Story of Victor and Purified Porcelain." For engineering data on all Victor insulators, write for Bulletin No. 4.

SPECIFICATIONS

Type.....ball socket	Leakage Distance.....11½"
60 cycle Dry Flashover.....80 KV	M and E Strength.....15,000 lbs.
60 cycle Wet Flashover.....50 KV	Impact Rating.....55 lbs.
Pos. Impulse Flashover*.....125 KV	RIN.....50 Microvolts
Neg. Impulse Flashover*.....130 KV	1000 KC at applied.....10 KV
Dry Arcing Distance.....7⅛"	

*Crest KV. 1½ x 40 microsecond wave Critical Value

FEATURES

1. Higher mechanical strength
2. Greater resistance to thermal variations
3. Unequalled uniformity of mechanical and electrical values
4. Unequalled resistance to impact
5. Specially compounded cement for maximum strength
6. Caps and pins scientifically designed to withstand pull far above NEMA specifications
7. All metal parts hot-dipped galvanized for maximum resistance to weathering and corrosion
8. Special "cushion" coatings at all joining surfaces

NEWS FROM VICTOR

Victor has more than doubled the area of its ceramic laboratory. The enlarged laboratory affords Victor better, more modern facilities for testing raw materials, controlling quality of production and carrying on basic ceramic research. It was made necessary by Victor's expanding research program now under way.

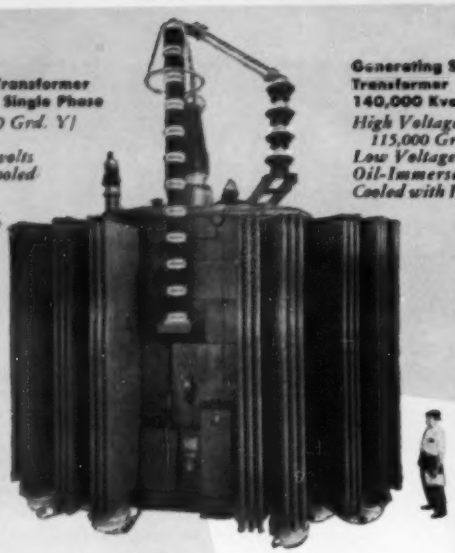
SPECIFY VICTOR

Purified Porcelain Suspensions!

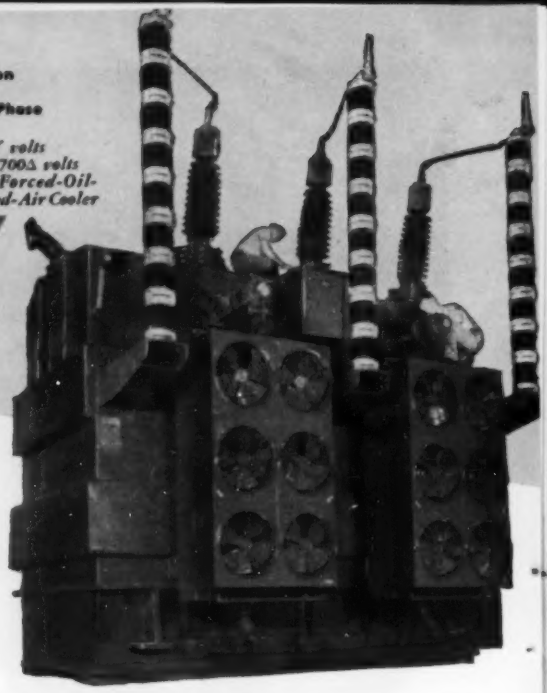
VICTOR INSULATORS, INC., VICTOR, N.Y.
SUBSIDIARY OF I-T-E CIRCUIT BREAKER CO.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

Generating Station Transformer
56,000/70,000 Kva, Single Phase
High Voltage: 161,000 Grd. Y/ 93,000 volts
Low Voltage: 19,000 volts
Oil-Immersed, Self-Cooled Forced-Air-Cooled

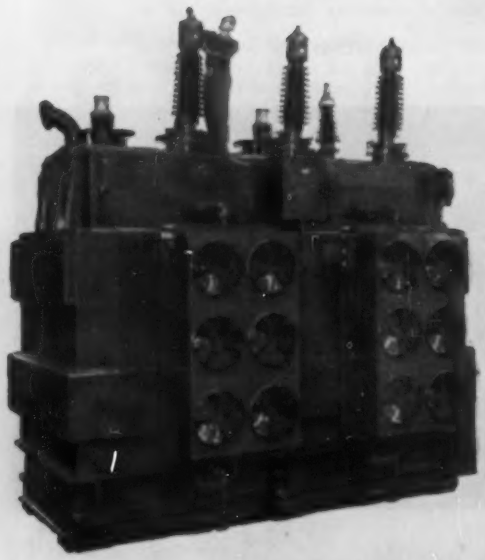


Generating Station Transformer
140,000 Kva, 3 Phase
High Voltage: 115,000 Grd. Y volts
Low Voltage: 14,700Δ volts
Oil-Immersed, Forced-Oil-Cooled with Forced-Air Cooler



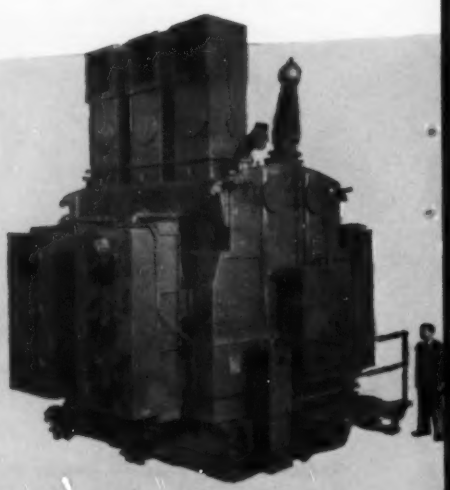
Generating Station Transformer
68,000/90,666 Kva, 3 Phase
High Voltage: 132,000 Grd. Y/ 76,200 volts
Low Voltage: 13,200Δ volts
Oil-Immersed, Self-Cooled/Forced-Air-Cooled

REPRESENTATIVE Power Transformers MANUFACTURED BY PENNSYLVANIA IN 1954

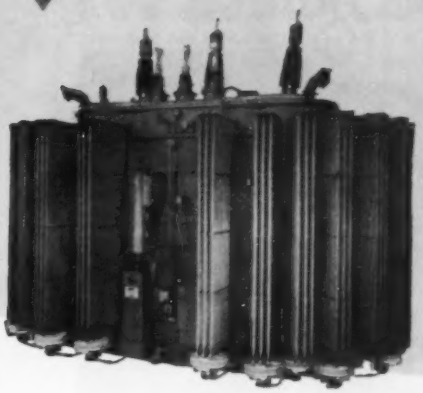


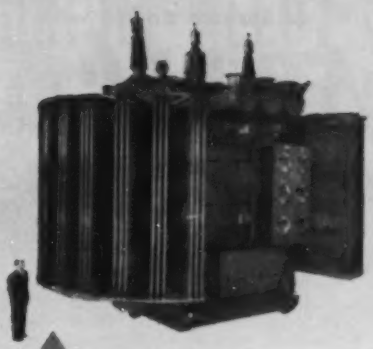
Generating Station Transformer
175,000 Kva, 3 Phase
High Voltage: 115,500 Grd. Y volts
Low Voltage: 17,500Δ volts
Oil-Immersed, Forced-Oil-Cooled with Forced-Air Cooler

Generating Station Transformer
120,000 Kva, 3 Phase
High Voltage: 145,000 Grd. Y volts
Low Voltage: 19,800Δ volts
Oil-Immersed, Forced-Oil-Cooled with Forced-Air Cooler



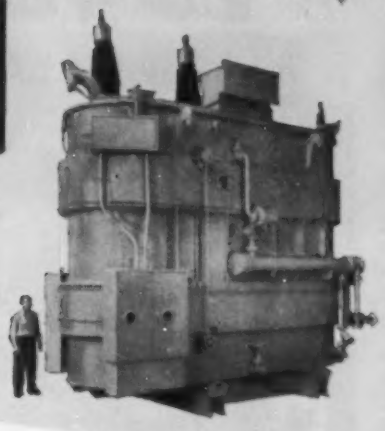
Generating Station Transformer
56,000/70,000 Kva, 3 Phase
High Voltage: 132,000Y volts
Low Voltage: 15,000Δ volts
Oil-Immersed, Self-Cooled/Forced-Air-Cooled





Substation Transformer
45,000/60,000 Kva, 3 Phase
High Voltage: 125,400Δ volts
Low Voltage: 13,800Y volts
Oil-Immersed, Self-Cooled/Forced-Oil-Cooled with provision for future OA/FOA/FOA rating of 75,000 Kva

Generating Station Transformer
48,000 Kva, 3 Phase
High Voltage: 115,000 Grd. Y volts
Low Voltage: 13,200Δ volts
Oil-Immersed, Forced-Oil-Cooled with Forced-Water Cooler

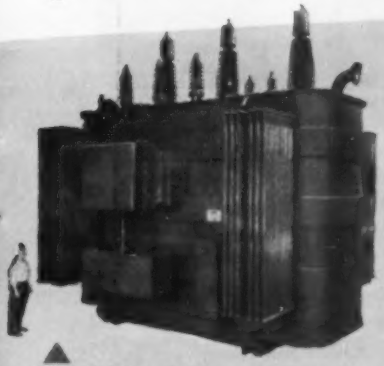


Here are some of the single phase and three phase power transformers manufactured by Pennsylvania in 1954. They are representative of the large core-form and contour-design (shell-form) transformers that are preferred by leading utilities and industrials. Some of these units are for generating station service. Others are typical power transmission transformers. Every type of cooling method is represented in these transformers. Typical accessories include load tap changing mechanisms, lightning arresters, and potential devices. In short, these transformers represent Pennsylvania's complete coverage for the large power transformer needs of this country.

Expanded plant facilities also made it possible for Pennsylvania to offer transformers in ratings up through 350,000 Kva and in voltages through 330 Kv. This includes load tap changing transformers up to 150,000 Kva.

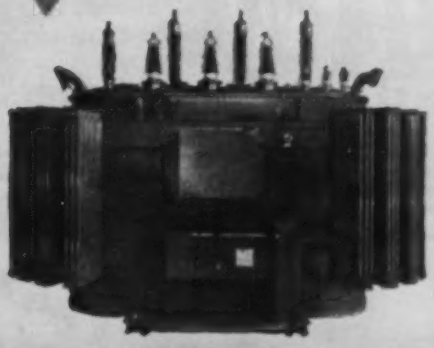
It is significant, too, that 1954 was a record-breaking production year at Pennsylvania, indicating in a concrete manner the trust placed in Pennsylvania Transformer Company, its people and its products.

PENNSYLVANIA TRANSFORMER COMPANY . CANONSBURG, PA.
A McGraw Electric Company Division



Substation Transformer
15,000 Kva, 3 Phase, with load tap changing equipment
High Voltage: 154,000Y volts
Low Voltage: 69,000 Grd. Y volts with plus and minus 10% regulation in 32—5/8% steps
Tertiary Voltage: 12,470Δ volts
Special design for shipping in one-piece tank

Substation Transformer
25,000 Kva, 3 Phase, with load tap changer
High Voltage: 138,000Y volts
Low Voltage: 69,000 Grd. Y volts with plus and minus 10% regulation in 32—5/8% steps
Tertiary Voltage: 12,400Δ volts
Oil-Immersed, Self-Cooled

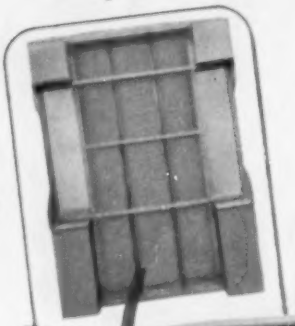


Substation Transformer
30,000 Kva, 3 Phase, with load tap changing equipment
High Voltage: 66,000Y volts, with plus and minus 5% regulation in 32—5/8% steps
Low Voltage: 33,000Y volts
Tertiary Voltage: 13,800Δ volts
Oil-Immersed, Forced-Oil-Cooled with Forced-Air Cooler

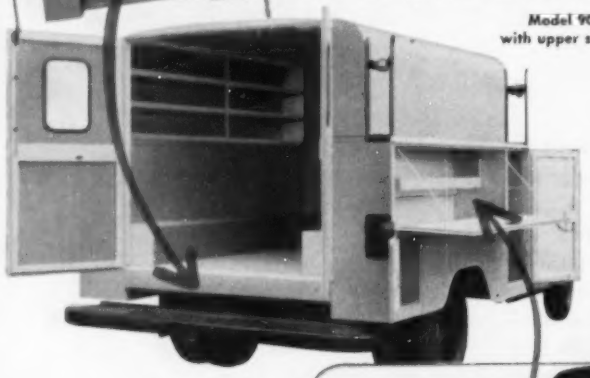
→ A Completely NEW LINE of Service Bodies with

25 FEATURES

that give a new meaning to "UTILITY"



1. Models to fit 40 different Chevrolet, Ford, International, GMC, Dodge and Studebaker chassis . . . single or dual wheel.
2. For ½ - ¾ - 1 - and 1½-ton trucks.
3. 18 different compartment arrangements.
4. Exclusive 4-point coil spring body mounting.
5. Complete line of Service Accessories.
6. Bonderized, all-steel welded construction.
7. Double lap-type joints.
8. Extra-wide doors for easy access.
9. Larger, greater capacity compartments.
10. Embossed door panels for rigidity and appearance.
11. Fully recessed door handles.
12. All doors keyed alike.
13. Tumbler-type locks at no extra cost.



Model 900 D with upper structure

Model 1050 D

14. Full bolt-action locking bar.
15. Weatherproof compartments . . . lap-seal and gutter drain on all doors.
16. Raised bottoms of all vertical compartments provide extra protection for tools and supplies.
17. Heavy-duty reinforced 16-gage bulkheads.
18. Outside compartment headers 14-gage steel.
19. 4-way, 12-gage, safety tread non-skid floor.
20. From 25 to 35 sq. feet of floor loading area.
21. Through wheel housings for universal dual wheel application.
22. Reinforced tailgate.
23. Extra strength, bridge-type construction with interlocking lateral and longitudinal reinforcements.
24. Side boxes supported by one-piece cross members, reinforced at mounting holes.
25. Beaded fender panels hinged for easy access to wheels and spring shackles.

For Better Service and Greater Utility . . . Specify

Morrison service bodies

→ WRITE FOR DETAILS: Morrison Service Body Division, MORRISON STEEL PRODUCTS, INC., 695 Amherst Street, Buffalo 7, New York

• Also manufacturers of MOR-SUN Furnaces and ROLY-DOOR Steel Garage Doors

Hydraulic Derrick

(*Continued from page* 186)

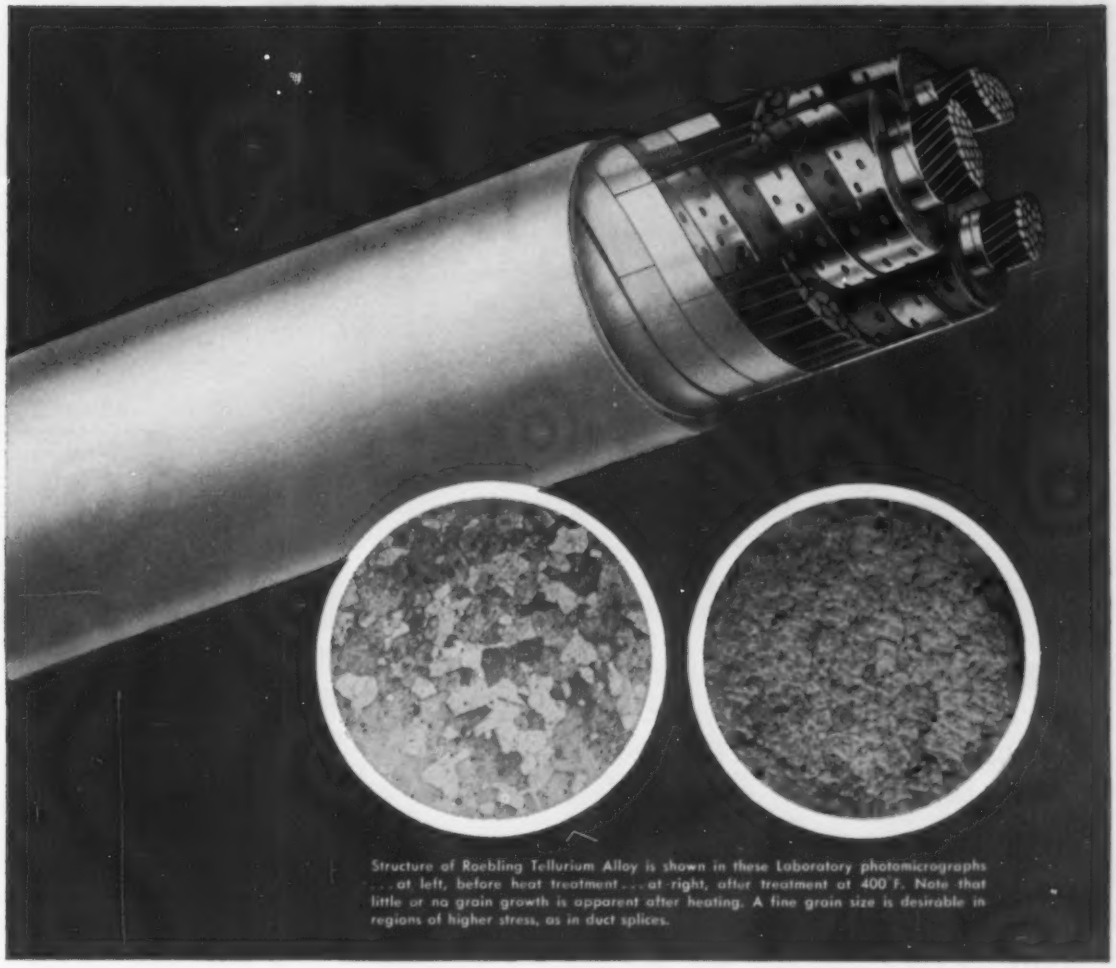
booms and taking them down. With the old-style boom it takes 30 to 35 minutes to get the boom out and erect it and another 30 to 35 min to take it down and store it. Only 30 sec is required for each operation with the hydraulic derrick.

Practice Pole Goes "Up and Away" for Storage

Floor space is free for other uses at Portland General Electric Co's Oregon City Service Center because the practice pole for training linemen may be stored parallel with the ceiling. The pole pivots near the top and is raised with a block and tackle that attaches to an eye-bolt at its base. For use in training, the pole is bolted securely to the floor. The "up and

(*Continued on page* 192)

ROEBLING TELLURIUM ALLOY LEAD SHEATH ASSURES FAR LONGER CABLE LIFE



Structure of Roebling Tellurium Alloy is shown in these Laboratory photomicrographs . . . at left, before heat treatment . . . at right, after treatment at 400° F. Note that little or no grain growth is apparent after heating. A fine grain size is desirable in regions of higher stress, as in duct splices.

BIGGER LOAD REQUIREMENTS! Higher temperatures! Increased movement of cable during load cycles! Today's best answer to each of these conditions is Roebling Paper Insulated Cable with Tellurium Alloy Lead Sheath*—the Roebling lead alloy that has completely superior resistance to fatigue.

In addition, Tellurium Alloy Lead Sheathed Cable has a lower long-time creep rate . . . high bursting strength . . . remarkable stability under heat application as in duct splicing and wiping. And on top of that, it eliminates need for frequent stop joints or reinforced lead sheath . . . does not require generous expansion bends or large manholes.

Write us now for full information. John A. Roebling's Sons Corporation, Dept. 707, Trenton 2, New Jersey.

*Licensed under Patent 2588095 March 4, 1952 and App. No. 308710, Sept. 9, 1952.

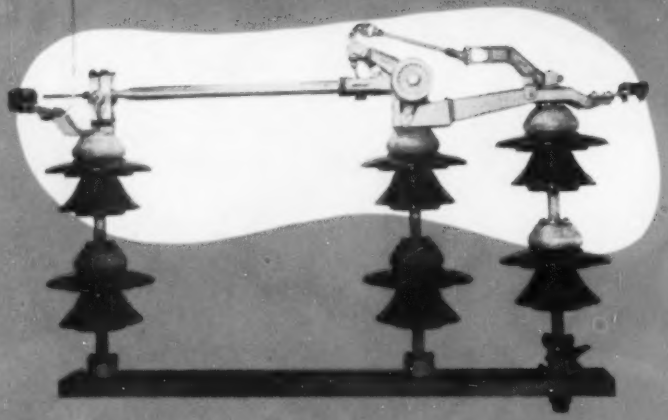
ROEBLING

SUBSIDIARY OF THE COLORADO FUEL AND IRON CORPORATION

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2552 FREDONIA AVE. • CLEVELAND, 12225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 918 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5240 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1950 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

USCO Vertical-Break Switches

High-pressure contacts that assure you long, maintenance-free operation (even under high-short-circuit conditions)!



USCO Type GT-22
Available: 7.5—230KV, 400, 600, 1200 & 1600 amperes (69 KV, 1200 ampere shown)

FROM ENGINEERING DESIGN to pattern shop to foundry to final assembly and adjustment, the USCO Type GT — and every other USCO switch — is built entirely within our own factory. The very finest in materials and craftsmanship are used in their manufacture. Thus, you're certain of the highest quality and the greatest value for your switch-purchasing dollars.

USCO SWITCHES are designed and built in conformity with NEMA and AIEE Specifications. Their application to your system will not only save you time and money, they'll assure you peace of mind.

FOR FULL DETAILS - without obligation — write us direct.

Another development in electrical power transmission equipment by

USCO Power Equipment Corp.

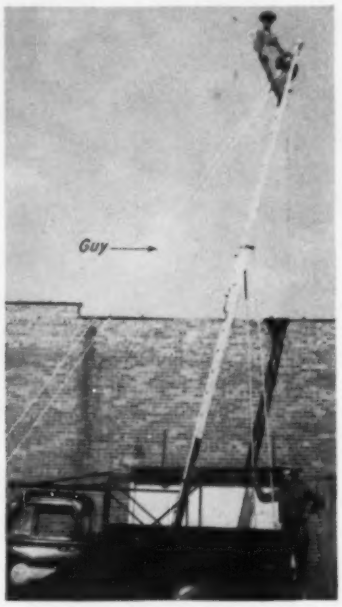
829 North 36th Way, Birmingham, Alabama—Phone 59-7241

Designers and manufacturers of high voltage electrical equipment

Practice Pole

(*Continued from page* 190)

away" idea was devised by Perry Landsem, Oregon City division superintendent, and Pat O'Connor, general line foreman.



IN EXTENDED POSITION the ladder is guyed to front of truck with a wire cable

Ladder Attachment Developed for Trucks

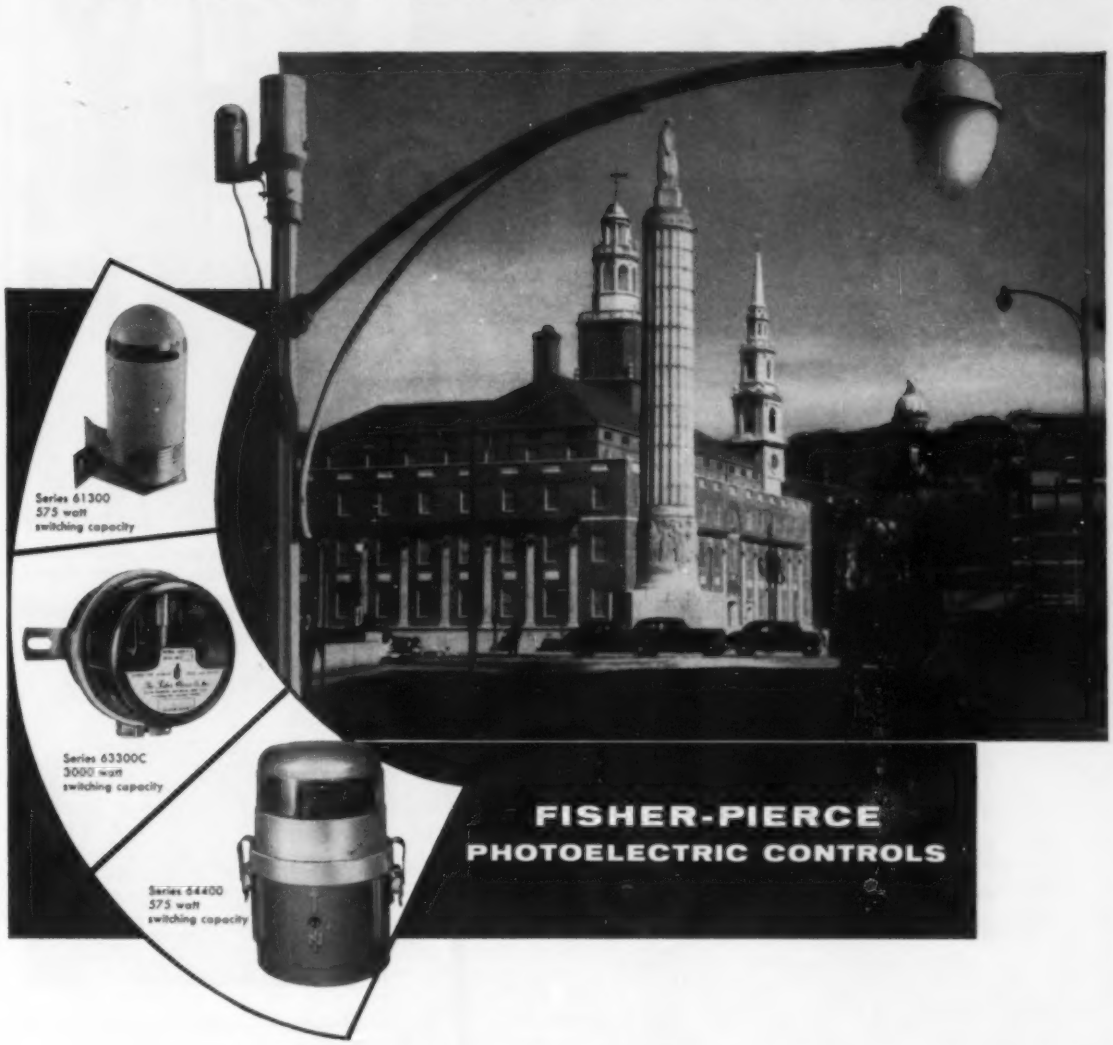
ROBERT LA FONTAINE, Iowa Electric Light & Power Co., Cedar Rapids, Iowa

A low-cost method of attaching a ladder to a truck has been developed by Peter Scott of Iowa Electric Light & Power Co. It is particularly applicable in outlying towns where frequency of ladder use does not warrant providing a special vehicle with a conventional ladder.

The ladder is pivoted on a steel tubular bar across the trouble truck, which facilitates rapid placement and removal and leaves the truck bed free of obstruction for normal operations. It is counter balanced with lead-filled pipes so that it can be pulled down into position easily.

Bracing members to the back of the truck box are made of steel tubing. When the ladder is fully extended its top is guyed to the front of the truck with cable.

CONTROLLING STREET LIGHTS IN PROVIDENCE, R. I.

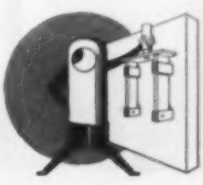


Motorists and pedestrians in Providence can thank their City Government for authorizing The Narragansett Electric Company to install dependable, automatically controlled street illumination.

The use of Fisher-Pierce street lighting controls assures dependable *automatic* illumination of streets the moment daylight drops below a safe value. Because F-P controls are photoelectric, they operate regardless of the hour, the season or the weather.

On the job in Providence since 1946, F-P controls now number about 3000. Narragansett engineers report favorable installation economics *and* an extremely low failure rate — only 2.29% of *all* units during a recent 12-month period.

Long, dependable service of F-P controls — in street lighting control systems in Providence and hundreds of *other* communities — is the basic reason Fisher-Pierce is recognized as a *leader* in its field.



THE
FISHER-PIERCE
COMPANY, INC.
82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILLIPS EXPORT CORP.
DIVISION OF NORTH AMERICAN PHILLIPS
100 E. 42ND STREET
NEW YORK 17, N. Y.

IN CANADA:
NORTHERN ELECTRIC CO., Ltd.

new act on the

high wire

When power line inspection got off the ground and into the air with Bell helicopters, costs and power line failures dropped to an all-time low.

Utility companies in the United States, Canada and France average from 25 to 50 miles of power line inspection *per hour* compared to 10 miles *per day* on foot. This means savings of 50 per cent and more in the cost of patrolling high tension lines.

You can profit by the world-wide experience of hundreds of companies in all industries who own or lease Bell helicopters. Our experts will be glad to help analyze your problems and demonstrate the economy and flexibility of the world's leading commercial helicopter.

There's a bonus in every Bell helicopter, too. In addition to power line patrol, these versatile aircraft are also used for topographical surveys ...carrying lead lines across inaccessible places... for emergency movement of crews and supplies... and for executive transportation.

Backed by more than a million flight hours, the Bell helicopter has a low initial cost, the *lowest* maintenance upkeep of any helicopter and is unequalled as a multi-purpose machine. It can operate in any climate, over any terrain, in any weather.

Complete details, including the sales representatives and commercial operators in your area, are available on request.

BELL Aircraft CORPORATION

Texas Division
Dept. HW11, P. O. Box 482, Ft. Worth, Texas

Sales and Service Representatives in 60 Countries

LADDER PIVOTS on steel bar and bottom fits against cross member to prevent slipping

When ready for travel, the ladder rests on the top of the truck, much as any other ladder.

Rubber Disks Guard Wire Brush Bristles

JAMES B. BOWEN, Superintendent, Electric Maintenance, San Diego Gas & Electric Co, San Diego, Calif.

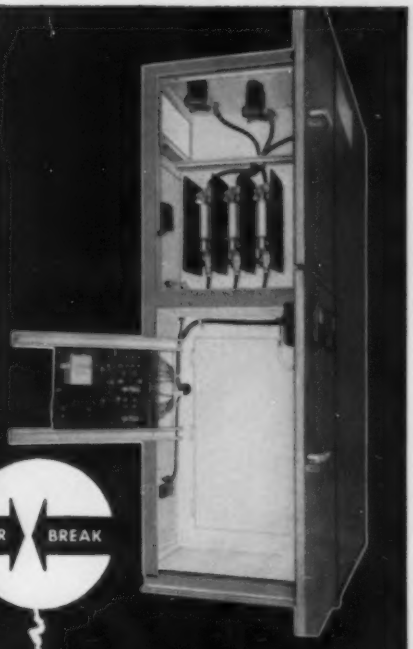
Rubber disk guards eliminate excessive breakage of bristles on rotary wire brushes. As used by San Diego Gas & Electric, the guards also prevent the sidewise entry of material into the brush.

Rubber disks may be cut from discarded lineman's blankets or similar material. They are clamped up tight to the brush, and centrifugal force tends to stiffen the soft rubber into an effective guard. Life of the brushes has been increased considerably. Life of each guard is quite long while its cost is very small.

AN EASY WAY TO SELECT HIGH INTERRUPTING CAPACITY STARTERS

50,000 KVA*	POWER FUSES		VALIMITOR	
2200-5000 volts	2300 Volts	4800 Volts	2300 Volts	4800 Volts
	150,000 kva	250,000 kva	unlimited kva bus	

* Certified



On Air-Break ZHA Starter, overload relay panel swings out. Opening of inner door gives access to motor terminals and rear of contactor.

AIR BREAK

YOUR BEST BUY FOR SHORT CIRCUIT PROTECTION

EC&M (2200-5000 VOLT) MOTOR STARTERS

OIL IMMERSED

EC&M Oil-Break Starter of VALIMITOR type has ZHS, 50,000 KVA Contactor mounted under oil in rear tank.

No matter how you figure it . . . high voltage motor starters, with adequate interrupting capacity, are your best investment.

Should a fault occur, vital drives are protected by clearing the circuit quickly. The need for extensive repairs or replacements has been minimized. Down-time is reduced. This results in lower costs.

Although short circuit values get greater as KVA capacities grow, EC&M's complete line of Motor Starters provides a wide range of selection to cover any requirement. They are available in Oil and Air-Break styles having interrupting capacity ratings shown above . . . note there are 3 ratings in both oil and air break.

The ceiling on the short circuit problem has been lifted. Be sure you have the information on this wide choice of EC&M Motor Starters for 2200-5000 volt motors.

Write for handy new catalog 6062 showing complete coverage of 2200-5000 volt motors.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 East 79th Street
Cleveland 4, Ohio

6072

INDUSTRIAL APPLICATIONS

BRAKE LININGS are bonded to brake shoes in 13-kw electric radiant oven. Conveyor carries parts through oven at rate of approximately 5 in. per min. Thermostat maintains oven temperature at 400 F

13-Kw Oven Doubles Output Of Bonded Brake Linings

JAMES R. WARK, Power Sales Engineer, Indianapolis Power & Light Co, Indianapolis, Ind.

Indianapolis Shock Absorber, Inc, has doubled its production of bonded brake linings by installation of a 13-kw electric oven with radiant heaters.

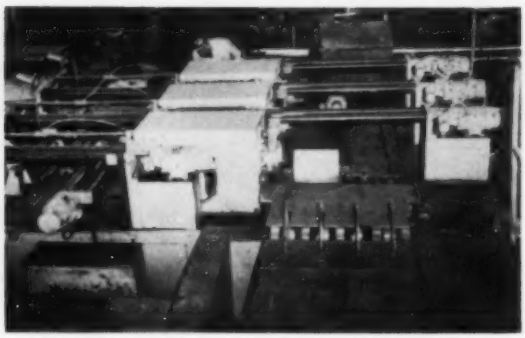
In the bonding of brake linings, a resin is applied to an asbestos lining which is pressure clamped to a brake shoe. This combination is heated in an oven at 400 F for the time required to get a good bond.

The job was formerly accomplished with a batch oven. This, however, presented a problem in controlling the time of bonding and in handling parts in and out of the oven. It resulted in a costly operation.

With the radiant heater oven, a conveyor carries the parts to be bonded through the oven at the rate of approximately 5 in. per minute. A thermostat maintains an oven temperature of 400 F.

The result is a high quality job at lower cost. There has been a reduction in materials handling. The conveyor speed controls the length of time for the bonding process. Equipment lasts longer. Maintenance costs have been reduced materially. There are no fumes from the heat source.

OLD GAS FURNACE increased operating costs by tying up billets when the extruder shut down. New heater ties up maximum of three billets. Old furnace also sprawled over more valuable floor space



NEW INDUCTION HEATER is easy to operate and needs less floor space than gas furnace. Maximum rating of two coils is about 225 kw each. Billets are heated evenly with a minimum of oxidation

Induction Heater Cuts Billet Heating Costs

PAUL H. HENRICHS, Industrial Power Engineer, Southern California Edison Co, Los Angeles, Calif.

An induction heater handles billets for extrusion more efficiently than the gas furnace formerly used at Revere Copper & Brass Co, Los Angeles. The 3-phase, 60-cycle heater quickly heats each billet to the same temperature. This is done with minimum oxidation. The electric furnace is easy to operate and requires less floor space than the gas furnace it displaces.

Formerly, when the extruder was shut down unexpectedly, a load of heated billets was left in the gas furnace. To keep these hot or allow them to cool was costly. Each coil of the induction heater holds two billets, one heating and one preheating. In case of extruder shutdown, a maximum of three heated billets are on hand.

Coils have a maximum input of about 225 kw each and can be operated simultaneously or individually. Temperature is automatically controlled and static capacitors correct the power factor to about 90%.

(*More Industrials on page* 198)

ALWAYS

Red at a glance

...in any light

...without twisting

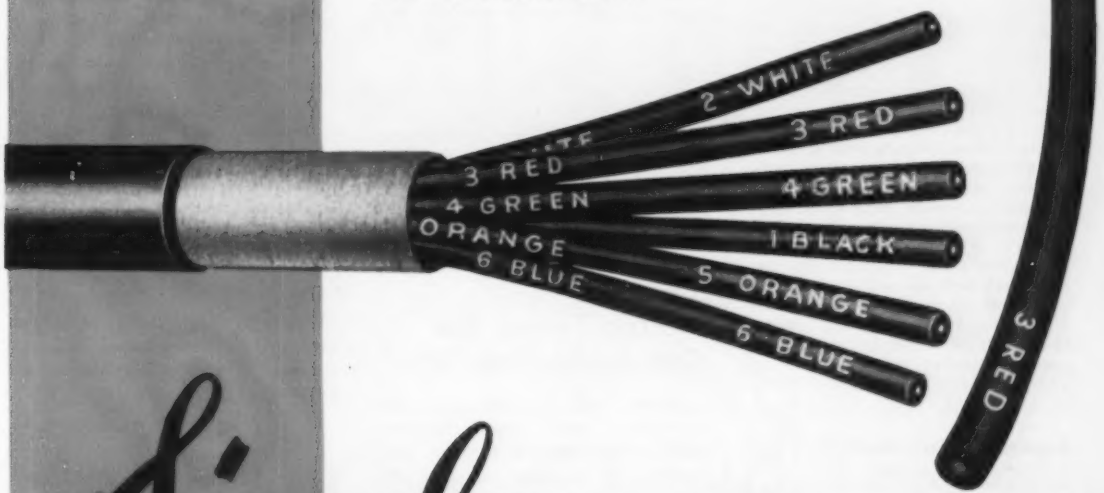
...no matter how dirty

Red conductors in Simplex Control Cables always read red. That's because they're positively identified by white printing on solid black background. They won't change color under different lights the way conductors with colored neoprene coverings do.

Simplex Control Cable conductors don't have to be twisted for identification because color coding is printed on both sides of every conductor at 2½-inch intervals.

And it doesn't matter how dirty conductors get during pulling, splicing, or termination. Simplex Printed Color Coding just won't blur, rub off, or lose its ability to provide quick, safe, sure conductor identification.

If you'd like a sample of Simplex Printed Color Coding and descriptive literature, drop a post card to the address below.



Simplex CONTROL CABLES

with PRINTED COLOR CODING

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Massachusetts

Pat. Pend.

*KLEIN KUT PLIERS

for both regular and heavy-duty cutting

It was Klein that produced the first and still the finest regular side-cutting plier. Klein also gave the industry the modern, streamlined version so much in demand.

And it's Klein again with a new, high leverage cutting plier for light- or heavy-gauge wire, including No. 2 weatherproof hard drawn solid copper wire, and A.C.S.R.

There's no extra hinging of any kind—no uncomfortable wide-spread handles—with this new Klein-Kut Plier. The offset hinge permits the extra-high leverage and operation is as smooth and easy as with any other Klein Plier. Forged from high-grade tool steel, individually fitted, tempered, adjusted and tested. Ask for No. 213-9 N.E. for streamlined pattern.

Regular pattern available

Same high-leverage design, but in the original Klein side-cutting pattern. Ask for No. 213-9.

Write for free Copy of Bulletin 1054

*Trade Mark

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

"Since 1857"

Mathias KLEIN & Sons

Pin Setter Ups Bowling Business 30%

Setting pins with electrically operated pin setters, has greatly increased business for John F. Duncan at the Plaza Bowl, Kansas City, Missouri. These mechanical men have solved the number-one problem that harasses the bowling alley operator.

Very few errors in operation have occurred and league bowling has been greatly speeded up. Open bowling has increased to the point that Mr. Duncan expect a 25% to 30% increase in business by providing available bowling time when pin boys would be unobtainable. A ¼-hp motor runs an endless belt which returns the bowling ball to the bowler in 15 to 19 sec from the time it hits the pins. The same motor drives another belt which moves the pins to a large "pinwheel" conveyor and in turn delivers the pins to a selector arm. The selector arm, by the use of a telescoping endless belt, deposits the pins on the spotting table. A ⅓-hp motor, through a series of trips and releases, operates the sweepguard which removes the "dead-wood" from the alley and prevents a ball from striking the pinspotter.

Another ⅓-hp operates the pin-spotter which resets the pins for the bowler. The operation is so rapid and accurate that it is always waiting for the ball. A "pindicator" flashes the pins by number that are left standing while a reset button allows the bowler to get a new set of pins at any time. George E. Wilson, Industrial Engineer, Kansas City Power & Light Co, Kansas City, Mo.

Electric Tunnel Kiln Cuts Baking Time 50%

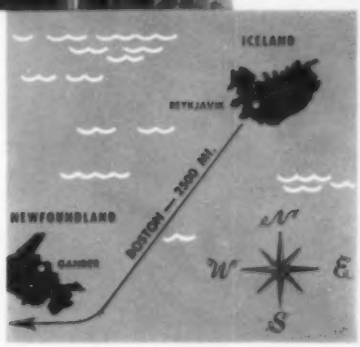
A new type of electric tunnel kiln cuts baking time of ceramic lamp bases 50% at Greenspan & Co, Inc, Philadelphia, Pa. A higher degree of product uniformity is also obtained through the improved distribution of heat in the new type of kiln. The 72-kw tunnel kiln in continuous line production replaces a batch type oven which was formerly used.

The new kiln is equipped with resistance type heating units and has three zones—for preheating, glazing, and cooling. Versatility in temperature range permits glazing of various sizes and shapes which could not be handled in a periodic-type kiln. L. Albertson, Philadelphia Electric Co, Philadelphia, Pa.

Cold Scales Work Now

Dashpot damping oil in platform scales is warmed by strip heaters to maintain accuracy and save time for State Metals & Steel Co, Canton, Ohio. A 500-w strip heater was put in air space below the balance bar where the dashpot is situated. H. T. Fessler, Industrial Power Engineer, Ohio Power Co, Canton, Ohio.

(*Industrial Briefs on page* 201)

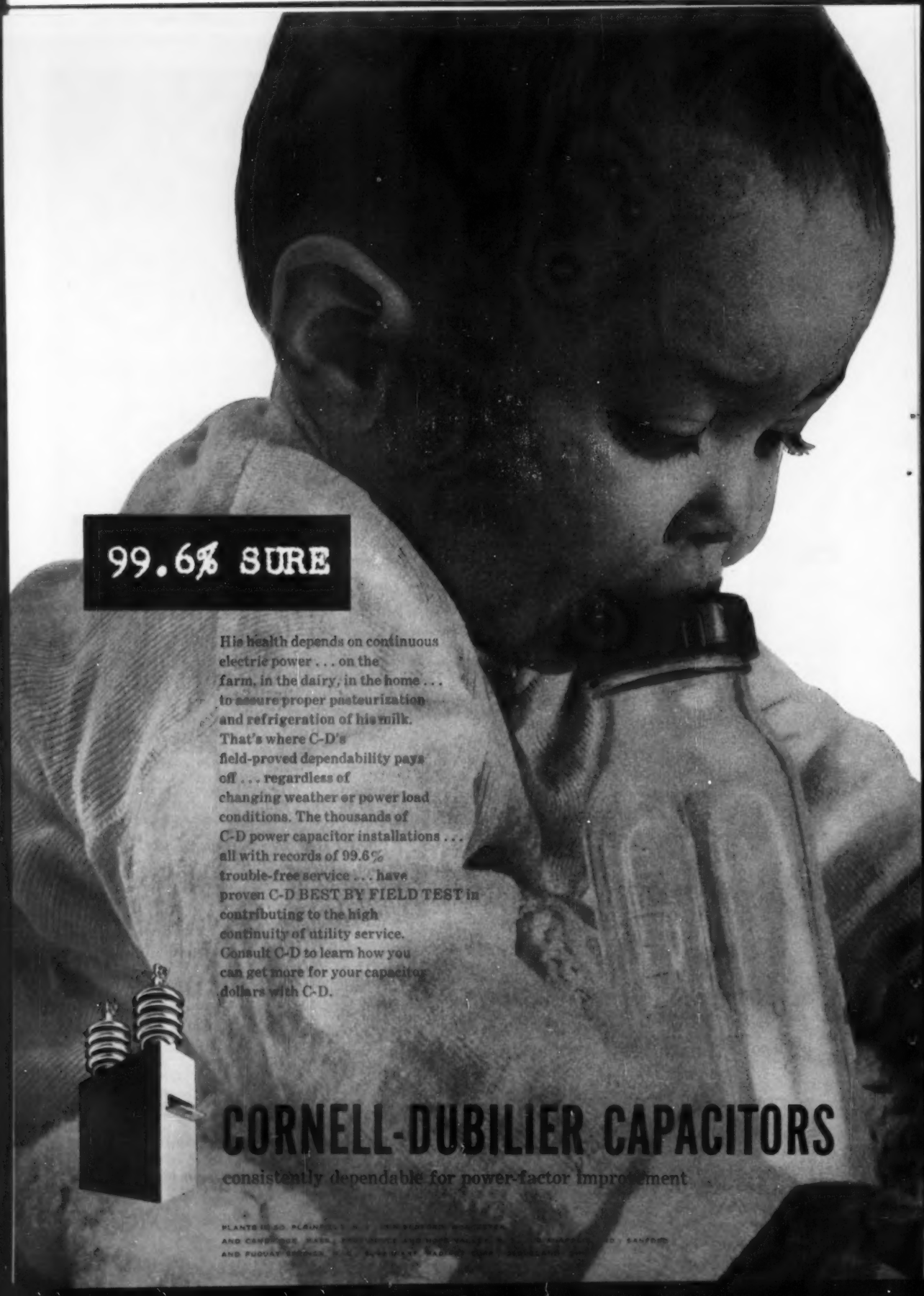


This headline from the Morgunbladid newspaper published in Reykjavik, Iceland announced that "The New High-Voltage Power Line From the Sogs-Waterfalls is Finished" This first high-voltage line to be built in Iceland brings power for new industries a distance of 35 miles from the Sog River to Reykjavik. The unusual terrain and difficult working conditions in Iceland made this another outstanding Hoosier installation. Because of Hoosier's long experience in handling difficult jobs, the work was done both efficiently and economically.

HOOSIER ENGINEERING CO.

ERECTION AND MAINTENANCE OF TRANSMISSION LINES

1384 HOLLY AVENUE • COLUMBUS 8, OHIO


99.6% SURE
His health depends on continuous electric power . . . on the farm, in the dairy, in the home . . . to assure proper pasteurization and refrigeration of his milk. That's where C-D's field-proved dependability pays off . . . regardless of changing weather or power load conditions. The thousands of C-D power capacitor installations . . . all with records of 99.6% trouble-free service . . . have proven C-D BEST BY FIELD TEST in contributing to the high continuity of utility service. Consult C-D to learn how you can get more for your capacitor dollars with C-D.
CORNELL-DUBILIER CAPACITORS
consistently dependable for power-factor improvement

CORNELL-DUBILIER power-factor capacitors give you better than 99.6% trouble-free service*

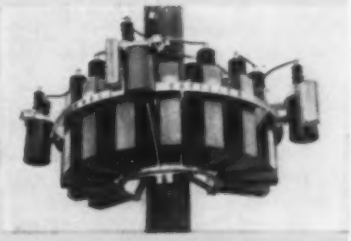
Lowest volts per mil unit stress results in the extra margin of safety necessary to withstand all system high voltage transients. This lower volts per mil and lower volts per section feature is the utility's assurance of extra longevity in its capacitor purchase when Cornell-Dubilier's are specified.

Only C-D power capacitors are subjected to a full-rated voltage energization test. C-D removes potential trouble-makers before they get on your poles . . . not after with costly replacements.

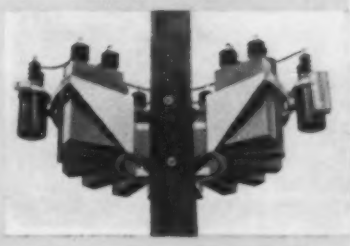
Lowest unit dielectric stress not only provides lowest voltage gradient for steady state operating conditions, but also highest withstand protection against the transients produced by lightning, circuit breaker re-strikes and all other line surges.

Heavy major insulation in the form of laminated liners, with reinforced corners insures highest impulse withstand levels. It means, too, a heavier capacitor unit . . . because it's a better unit . . . but at no extra cost to you. How would you relate a slight increase in weight to years of trouble-free service?

Why is it that only C-D power capacitors give you assurance of complete dependability?... because C-D's built-in safety factor results from the ultimate in tried and proven design levels coupled with conservative production techniques and rigorous quality control. For catalog write to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



C-D's new semi-round pole mounting Contour Capacitor® Rack.



***This is an average based on reports from leading utilities using C-D capacitors. Many of these reports have shown 100% trouble-free service, and none lower than 98.9%.**

INDUSTRIAL BRIEFS

Electronic heat thrown off during tests of huge thyratron tubes is being used to meet half the heating requirements of a General Electric radar defense equipment plant in Scranton, Pa. Cooling air leaving the 64 tube testers is at about 100 F, and is piped to the regular ducts of the building's heating and air-conditioning system. If all available heat were tapped, it would be sufficient to warm 130 six-room houses in Scranton's climate. Robert F. Horvath, Plant Engineer, General Electric Tube Plant, Scranton, Pa.

Closed-circuit TV now speeds auto parking in a lot operated by the Downtown Merchants Parking Assn. in Oakland, Calif. Mounted atop a light standard overlooking the lot, the camera feeds a 21-in. television receiver in the entrance booth. Remote pan and tilt controls enable the attendant to scan the 67,500-sq ft lot quickly, then advise the motorist where to find a space. M. S. Klinedinst, Manager, Distributed Products, Radio Corp. of America, 30 Rockefeller Plaza, New York 20, N. Y.

Drying shoes in an 18-kw infrared oven at Banner Slipper Co, Honesdale, Pa, has inceased production at the rate of 220 additional cases per day. The infrared oven replaced steam-heated ovens with resulting saving in floor space, better working conditions, reduced labor, and elimination of steam lines. This first infrared oven, which is used for drying the uppers of children's oxfords, is expected to be the "entering wedge" for replacing all the company's steam ovens eventually. Charlie Miller, Industrial Power Representative, Pennsylvania Power & Light Co, Wilkes-Barre, Pa.

Four strip heaters protect a standby M-G set in an unheated power house for Industrial Forge & Steel, Inc, Canton, Ohio. The set is covered with a canvas, and the 500-w heaters, on a portable stand, are put under the unit. This eliminates danger of moisture damage to windings and keeps the unit ready for immediate operation, even in cold weather. R. L. Dible, Industrial Sales Representative, Ohio Power Co, Canton, Ohio.

AW Gets Some New Twists

Commonwealth Edison offers bargain prices, Twin Cities group plugs wiring "package" in new pitch for better home wiring

Wiring promotion plans with some promising new wrinkles to them were put before the public this month in two major midwestern centers.

Commonwealth Edison Co is offering "bargain priced" wiring which it hopes will induce installation of 3-wire, 240-v service in the more than 600,000 Chicago and northern Illinois homes it knows to have outmoded, 2-wire service.

Meanwhile, a Twin City industry group will try to woo Minneapolis-St. Paul residents to better wired homes with a unique "Package" plan which offers a group of wiring improvements under one time-payment arrangement.

Commonwealth's idea works this way:

It installs at a "bargain price" all of the outside equipment, including the necessary service entrance. The latter is ordinarily paid by the customer. It is estimated that this will result in a saving of $30 or more. Plan applies to those living in one, two and three family dwellings.

Who Gets It? . . . Any customer who installs a 240-v appliance and also agrees to install a 100-amp main switch plus the circuit required for the appliance will qualify for the outside wiring concession. The company will finance the switch and appliance circuit (and additional inside wiring up to $100) with installments payable monthly. Electrical contractors in each community will make wiring installations at fixed prices for each appliance.

Said Willis Gale, Commonwealth Chairman: "We hope to make our service territory the best wired of any comparable area in the country." We realize we can't do this overnight but we are prepared to carry out a long range program to bring it about."

The 240-v electrical appliance which is required under the program may be a range, a clothes dryer, an air conditioner, a built-in auxiliary heater or a water heater. If a customer buys a new 240-v appliance, he may purchase it from any dealer. The wiring installation provided for in the program will permit the installation of up to ten 120-v circuits, as well as the 240-v service.

Want to Know More?

Wiring finance plans will get top attention at the 11th Adequate Wiring Conference slated for LaSalle Hotel in Chicago, Feb. 24-25.

Other adequate wiring subjects to be covered: dealer and distributor promotion, selling it to the farm, new residential standards, apartment house modernization and AW's appeal to consumers. Conference has been called by National Adequate Wiring Bureau.

Industry-wide Sponsorship . . . The Twin City plan, sponsored by a committee of electrical contractors, unions, wholesalers, manufacturers and Northern States Power Co, offers a package deal which the homeowner can finance for $10 down and $5 a month. Package provides:

- New service entrance wires of up-to-date capacity.
- Service entrance panel of 100-amp capacity with provisions for future connection of range, dryer, freezer, air conditioner, etc.
- Two new 20-amp appliance circuits, one for the kitchen and one for the laundry, or both for either location.
- Removal of all old service equipment located in the basement.

Time-payment finance plan is offered by a local bank to home owners in the Twin-City market area served by Northern States Power. Unpaid balance on a rewiring contract is added in equal monthly installments to the home-owner's electric bill. Plan also allows home-owners to finance "Package Plan" re-wiring contracts with an FHA loan, through an open-mortgage or through other banks who offer time-payment loans for property improvements.

Budget for "Operation Package" has been underwritten by local chapters of National Electrical Contractors Association, Electrical Workers Local 110 of St. Paul and Local 292 of Minneapolis; electrical wholesalers; electrical manufacturer representatives and Northern States Power. North Central Electric League will trustee the funds of the committee, supply office facilities and coordinate the activity.

To point up the need for the "Package Re-Wiring Plan" in the Twin City area, a survey is presently being taken to determine percentage-wise the number of homes with "dated" or inadequate wiring systems.

Lamp Sales for '55 Will Be Up Says GE

Lamp sales by General Electric Co's Lamp Division are anticipated to rise 5% during 1955, announces Donald L. Millham, vice president and general manager of the division.

"If we can realize this increase in business, 1955 will be a new record year," he says. To do it, GE will increase the division's sales force, and up its technical facilities, advertising and sales promotion.

The entire U. S. lamp industry this year, he declared will produce an estimated 2¼ billion lamps with an approximate retail value of $700 million. These include 90 million fluorescent units, 975 million large incandescents (largely household sizes), 500 million photographic, 380 million miniature, and 295 million Christmas lamps.

Northwest to Push Farm Sales Through Council

Pacific Northwest region has joined in the Inter-Industry Farm Electric Utilization Council's rural sales building efforts with the organization of a council regional committee. R. B. Smith of the Inland Power & Light Co of Spokane will act as chairman and Arthur Mayer of the Washington Water Power Co, Spokane, will serve as secretary.

(*More S & S on page* 204)

25 KVA
distribution transformer

5000 KVA, 3-phase
oil-immersed power transformer

★ Important reason why every CENTRAL TRANSFORMER is of consistent high quality . . . why longer life, uninterrupted performance is assured

Each detail in the manufacture of Central transformers is checked and double-checked against rigid specifications. Not until the chief inspector's final OK is stamped on the tag, is a Central transformer ready for delivery.

It is this exacting inspection, plus careful engineering, finest materials, skilled workers and a modern plant that has won for Central a reputation for the design and manufacture of transformers unexcelled anywhere.

No wonder more and more firms are looking to Central for precision-built transformers. Why don't you discover how Central can serve you?

A type for every need . . . from the smallest to the largest

CTC NEMA **Central** TRANSFORMER CORP.

PINE BLUFF, ARKANSAS
Sales Offices in principal cities.

DESIGNERS AND MANUFACTURERS OF TRANSFORMERS ONLY

RICHARDSON-ALLEN

AUTOMATIC FLOAT CHARGERS

Why take chances?

Keep your substation batteries properly and fully charged with a

DEPENDABLE BATTERY CHARGER

RICHARDSON-ALLEN Automatic Chargers feature–

- ★ Saturable reactor and magnetic amplifier control
- ★ Constant DC voltage ±1%
- ★ Automatic line correction
- ★ Long-life selenium rectification
- ★ Integral boost charge, if desired

Write for technical bulletin. Prices on request.

RICHARDSON-ALLEN CORPORATION

a manufacturing affiliate of

Wesley Block & Co., Inc.
39-15 Main St. Flushing, N. Y.

In Canada: Richardson-Allen of Canada, Ltd.
370 Victoria St., Toronto, Ont.

Keeping Costs Down Sell Street Lights

Economical design and construction methods have helped Public Service Co of Indiana sell improved street lighting, like this new system in Lafayette, to bulk of the 289 communities in its service area. To keep costs down, company many times puts new upsweep brackets and fixtures on existing wood poles. In other cases, metal standards are installed with either underground cable or with open-wire series circuits attached near the top of the standard. In 1946, 57.4% of overhead lamps in PS of Indiana towns were 1,000 lumen. Today this percentage has shrunk to 12.3%. New facilities are owned and operated by the company which now has some 29,000 street lights in service—LELAND HOLTMAN, Assistant to Vice President—Sales, Public Service Co of Indiana, Plainfield.

Better Market Judgment Needed, Says Executive

Market miscalculations by two or three manufacturers of an appliance can upset the entire appliance market, Parker H. Ericksen, Avco Manufacturing Corp. vice president, has declared. "A miscalculation of 1% by a producer as to his proper share of the market," said Ericksen, "plus a 10% error in estimating the industry volume, results in sufficient overproduction to start a wave of price cutting." Speaking before a recent Institute of Appliance Manufacturers meeting, he urged better market reporting systems as first major step in increasing profit margins.

Broadens Pump Policy

Union Electric Co of Missouri has decided to promote heat pumps using air or water as well as those using only the ground as heat source. The change in policy was announced at a series of meetings the company held recently to kick off a new heat pump sales program. It formerly had restricted its sales efforts only to those models using ground coils.

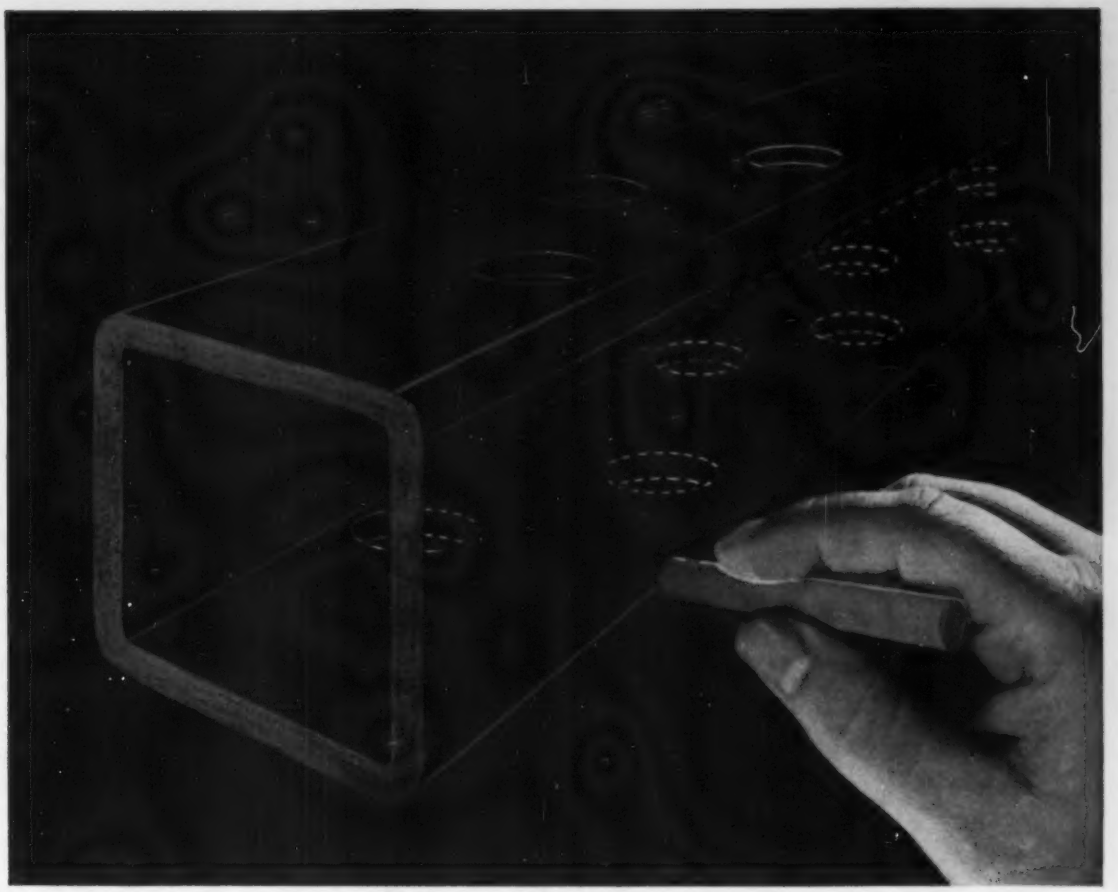
Electric Boilers to Be Produced and Sold Here

Production will start soon in the U. S. of an English-developed, electrically-fired automatic boiler. Unit which supplies hot water or steam for many uses, will be manufactured by Orr & Sembower, Inc. of Reading, Pa.

The manufacturer notes that while low-cost gas and oil has kept the demand small for electric boilers in this country, its advantages and specialized applications give it a definite market here. It points out that electric boilers would be completely clean and noiseless, require no exhaust vents, and would permit installation anywhere.

Boiler is being shown in Philadelphia at American Society of Heating and Ventilating Engineers Exposition.

(S&S shorts on page 206)



THE ADVANTAGES OF

VENTILATED SQUARE TUBE

BUS CONDUCTORS

Ventilated square high-conductivity ANACONDA Copper Bus Tubes are perforated with rows of holes drilled on two opposite sides to create active circulation of air across the interior. These "ventilated" bus conductors combine the structural strength of ANACONDA Square Bus Conductor Tubes with a measure of the air cooling advantage provided by the open slots, top and bottom, of the Anaconda double channel construction. Ventilated square bus conductor tubes are used where convection-current air cooling is effective. Under such conditions it is practical to up-rate the capacity of the undrilled conductor section.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 83126 Rev.

carry the load with ANACONDA® Bus Conductors

5 reasons for specifying RT&E TRANSFORMERS

5 HIGH IMPULSE LEVEL

Impulse level with built in safety factor considerably exceeds industry standards and is accomplished by—low layer insulation voltage stress—stepped back and graded overinsulation—space wound windings at coil ends—taps positioned in center of H.V. windings.

4 OIL FILLED PRIMARY BUSHINGS

Primary bushings are a wick-fed oil-filled type to eliminate corona and radio noise.

3 EXTERNAL TAP CHANGER

All tap changers are externally operated to avoid opening of unit—breaking of factory cover seals—contamination of oil from moisture and dirt—provides a greater convenience for tap changing and tap position identification in a matter of seconds. Unit remains sealed for longer life.

2 STANDARD 5 YEAR GUARANTEE

All RT&E transformers are guaranteed for 5 years from date of shipment from factory, free from defective workmanship and materials.

1 D. B. P. C. (inhibited oil)

All RT&E transformers are inhibited with D.B.P.C. to reduce oxidation—sludge—corrosion—acid formation and to increase transformer life.

SIZES
3 THRU 500 KVA
2400 TO 14,400 VOLTS
SINGLE & DOUBLE BUSHINGS

WRITE FOR CATALOG

RT&E Co.
WAUKESHA WISCONSIN

S & S Shorts

Bigger Fan Loads?

Are growing air conditioning loads helping to build simultaneous electric fan loads too? Robert Orr, chairman of the Electric Fan Section's Merchandising Committee, National Electrical Manufacturers Association, says increased use of air conditioners has tended to stimulate electric fan sales. Users, he says, have discovered that room cooling units can be made more efficient by supplementing them with fans to pull out heated air, and to better circulate the cooled air within a room or series of rooms.

Outdoor Lamps to Move from Lynn

"The Outdoor Lighting Center of the World" is what General Electric Co. is calling the new multi-million dollar factory it will establish at Hendersonville, N. C. Plant will become headquarters for GE's Outdoor Lighting Department, now located at Lynn, Mass. To go into production in 1956, it will make street and floodlighting equipment, traffic control systems, and military and airport lighting.

Freezers Lag in Big Towns

One or more food freezers are owned by 10.1% of the nation's households, according to a study reported by "Farm Journal" magazine. Freezer purchases by families in big cities, however, have lagged behind small town and farm residents: 51% of nation's households—those located in places of 10,000 or less, or on farms—own 77.6% of the freezers.

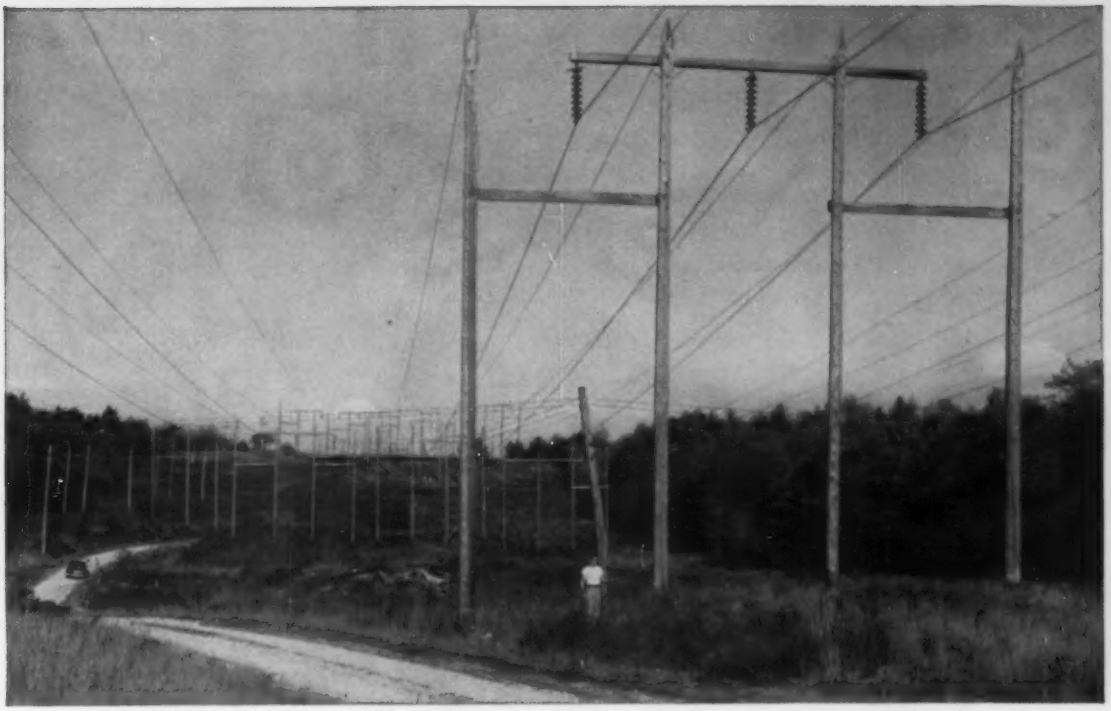
New Push for Housewares

A "dynamic" promotional boost is slated for electric housewares in 1955, announces H. S. Perkins, chairman of Electric Housewares Section of the National Electrical Manufacturers Association. Promotional coordination between manufacturers, utilities, electric leagues and distributors will aim at pre-selling housewares as gift items.

New Products:

A new type of electric houseware called the Hot Pot, an all-purpose electric utensil for boiling eggs, heating baby foods, etc., is being marketed by Landers, Frary & Clark.

DOW



Sprayed right-of-way through timber-grown area, shows result of treatment with Esteron 245.

ESTERON 245 CUTS CLEARANCE COSTS

. . . is the most versatile material you can use for brush control on right-of-ways

Esteron® 245 fills many roles in a low-cost, year-around brush control program on right-of-ways and around installations. All-season spraying with this powerful 2,4,5-T ester brush killer keeps your line-cleaning crews busy and your equipment in use more months each year and saves you up to 50% over cost of hand-cutting.

Versatile Esteron 245 is useful as an over-all foliage spray in growing season and for year-around basal bark and stump treatment. Basal spraying with hand or power equipment lets you pinpoint the killing power where you want it. As a supplement to foliage spraying, basal treatment takes care of "misses" and new growths. *In any season*—even during the winter months—application of Esteron 245 in oil to the trunk base of standing brush gives good results. Used for stump treatment, it makes manual cutting more effective as a control measure. Dow sales and technical men will be glad to help you outline a year-around spraying program with Esteron 245. THE DOW CHEMICAL COMPANY, Agricultural Chemical Sales Department, Midland, Michigan. In Canada: Dow Chemical of Canada, Limited, Toronto, Canada.

you can depend on DOW AGRICULTURAL CHEMICALS

DOW

NEW EQUIPMENT

Tension Wire Stringer

Overhead power lines can be strung under tension with a trailer that attaches to most trucks. Accommodating reels up to 69 in. dia, and conductors up to 556 MCM ACSR, the Model 5000 Pengo tension wire stringer is said to cut wire-stringing costs.

Four reels are placed in cradles of hard rubber tire rollers, which are provided with brakes to keep conductors taut between reels and first bull wheels. After making the proper number of turns around the bull wheels, the conductor pays out to the overhead line under tension.

When the first dead-end pole is reached, the reel tender cinches the brakes. Conductors are dead-ended without additional sagging.

Petersen Engineering Co, Manufacturers, Santa Clara, Calif.

Hot Water "Cooler"

Office-type water coolers now can also dispense hot water at the correct temperature for making instant coffee and other hot beverages. This is expected to reduce time that employees are away from work during "coffee break" periods.

Available either in a pressure or bottle type, the machines have a hot water capacity of five quarts (about 25 full cups) and recovery rates of 40 to 60 cups an hour. The 85/15 red-brass hot water tank has a 500-w tubular heater attached to the outside. Water temperature is thermostatically controlled up to 185 F.

Ebco Mfg Co, Columbus, Ohio

Aluminum Bus Conductor

Aluminum bus conductor, designated "RABC," is reported to have improved mechanical properties, and high electrical conductivity. Tables give specific data.

Reynolds Metal Co, 2500 So. Third St, Louisville, Ky.

Table 1. Aluminum vs. Copper Bus Conductor Materials

Properties	Copper	Aluminum EC-H17	Aluminum RABC
Tensile Strength, psi	33,000 to 37,500	17,000	29,000*
Yield Strength, psi	Not Specified	15,000	25,000*
Electrical Conductivity, % IACS	98	61	55*
Current Carrying Capacity,† %	100	82	79
Resistivity @ 20 C, microhms, sq in. per ft	8.31	13.36	14.82
Modulus of Elasticity, psi	16×10^6	10×10^6	10×10^6
Density, lb per cu in.	0.322	0.09765	0.09765
Temp. Coeff. of Resistance, % per deg C @ 20 C	0.393	0.403	0.360

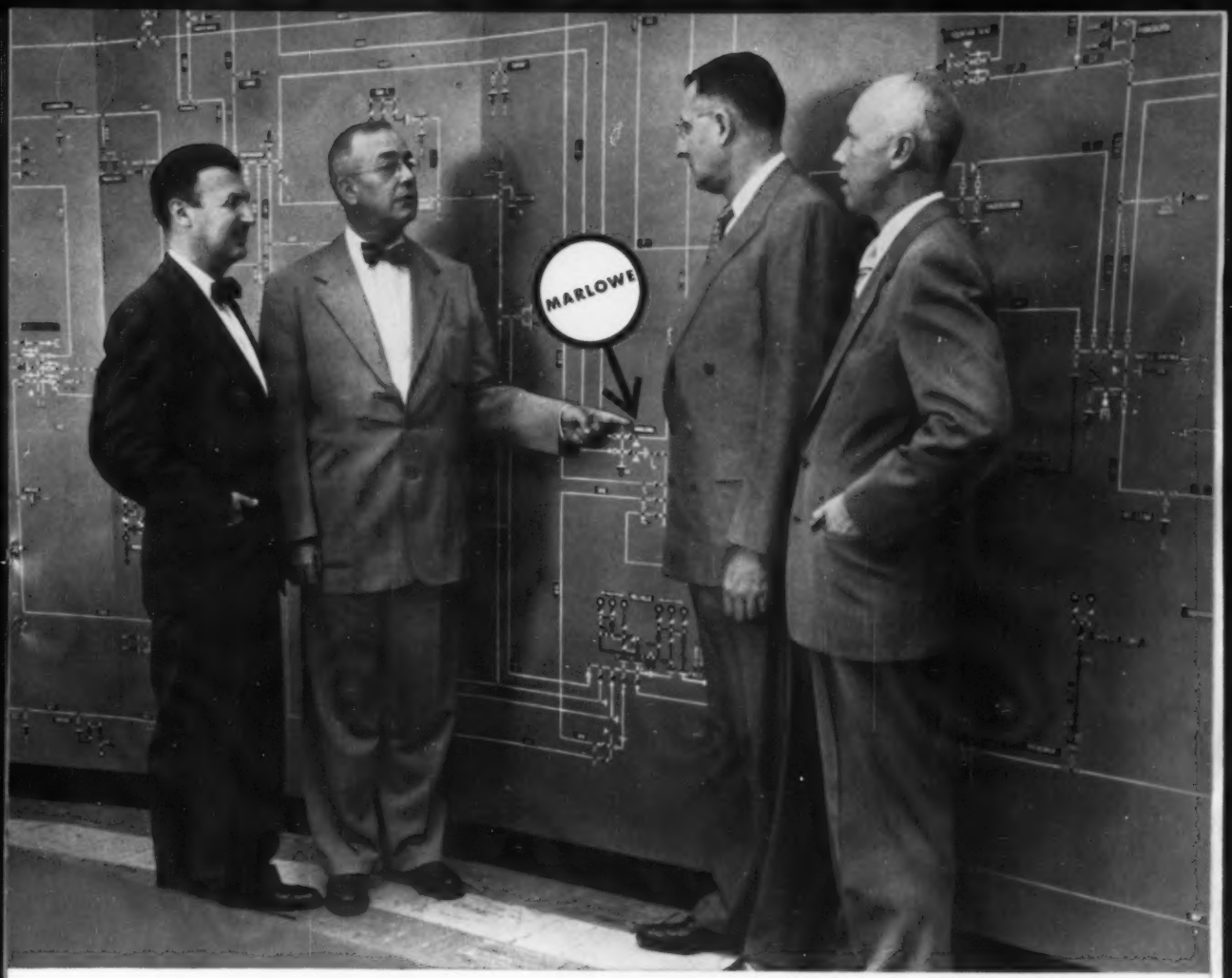
* Guaranteed minimum.

† For given temperature rise and same cross section.

Table 2. Cost Comparison

Item	Copper	Aluminum EC-H17	Aluminum RABC
Weight per ft, lb	2.9	1.17	1.17
Price per lb, $	0.45	0.607	0.426
Price per ft, $	1.30	0.71	0.50

(*More New Equipment on page* 217)



MARLOWE SUBSTATION—

"Packaged" for Potomac

. . . from penciled line diagram to completed substation—with one contact! That's the story of the building of Marlowe Substation.

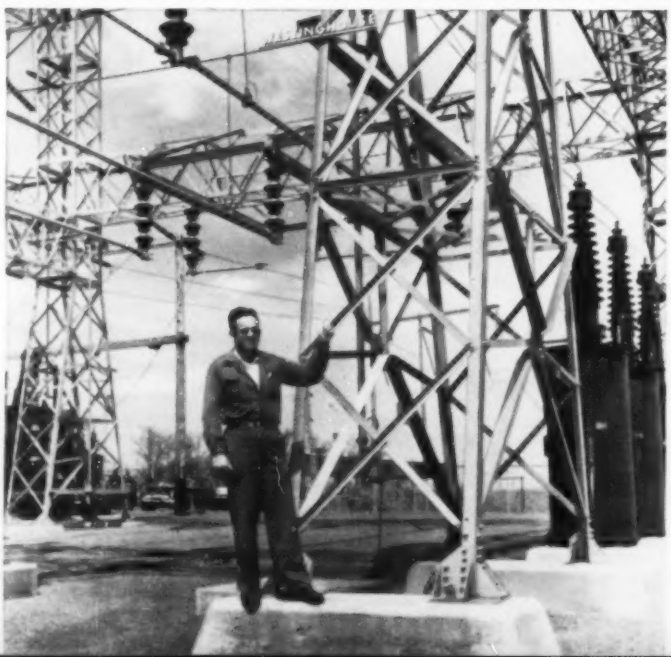
Fast-growing Potomac Edison with headquarters at Hagerstown, Maryland, covers 8,000 square miles of rural, industrial and commercial load area. Their basic transmission triangle, with sides approximately 60 miles in length, has just been stepped up to 132 kv.

Marlowe, master control link in this new system, is a modern coordinated substation. The details of its construction, with some of the outstanding factors responsible for savings realized, are told on the next seven pages.

Grouped in front of the system dispatching board at Marlowe Substation of Potomac Edison Company are (left to right): C. S. James, System Operator; H. H. Startzman, Chief Engineer; W. C. Feaster, Electrical Engineer—all of Potomac Edison—and J. N. "Nick" King, local Westinghouse representative—Potomac's one contact.

Westinghouse

Over-all view of Marlowe Substation—operational headquarters of Potomac Edison's 8,000-square-mile system. A fully coordinated modern substation by Westinghouse.



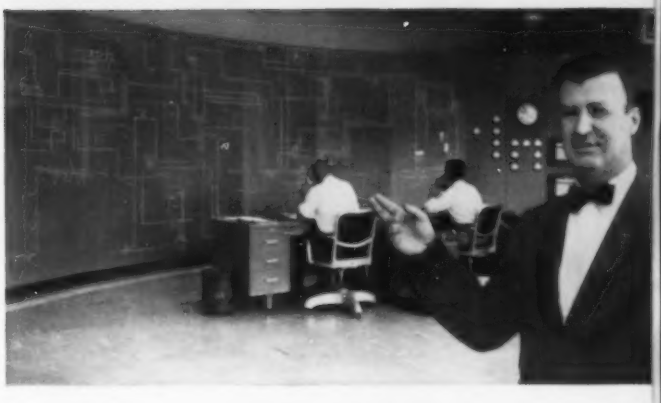
K. C. Miller, Construction Foreman for Potomac Edison, who was in charge of building Marlowe Substation. The complete packaged coordination of Marlowe made his job easier—and faster. Note space-saving underhung Type RL side break disconnects for circuit breaker isolation.

Modern Marlowe Substation is Potomac's operational nerve center

The site for Marlowe Substation—on the high south bank of the Potomac directly opposite the R. Paul Smith generating station—was selected for three reasons. First, it avoids the possibility of flood, which in 1936 completely submerged the first floor of Smith Station. Second, the high south bank enables Marlowe to avoid excessive maintenance costs due to smog and fly ash. And third, Marlowe is the load center of Potomac Edison's growing system.

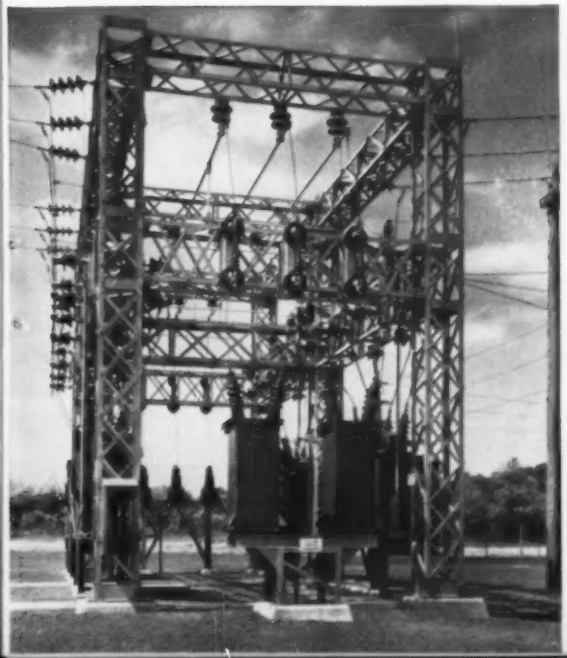
From Marlowe, system load dispatchers supervise and control transmission of power to all points on company property—utilizing microwave and power line carrier for communication and protective relaying. The most modern of protective and control equipment makes Marlowe Potomac's most efficiently operated substation.

Let's see how Nick King and Westinghouse helped Potomac to beat their construction deadline and also, in the words of H. H. Startzman, Chief Engineer of Potomac Edison, made possible "substantial savings in engineering costs".



C. S. James and his system dispatchers at the large, color-coded dispatching board at Marlowe. From this point, dispatchers supervise and control transmission of power throughout the system.

View from Marlowe Substation down the hill and across the Potomac River to the R. Paul Smith Station—largest of Potomac's 15 generating stations; capacity 91,400 kw.



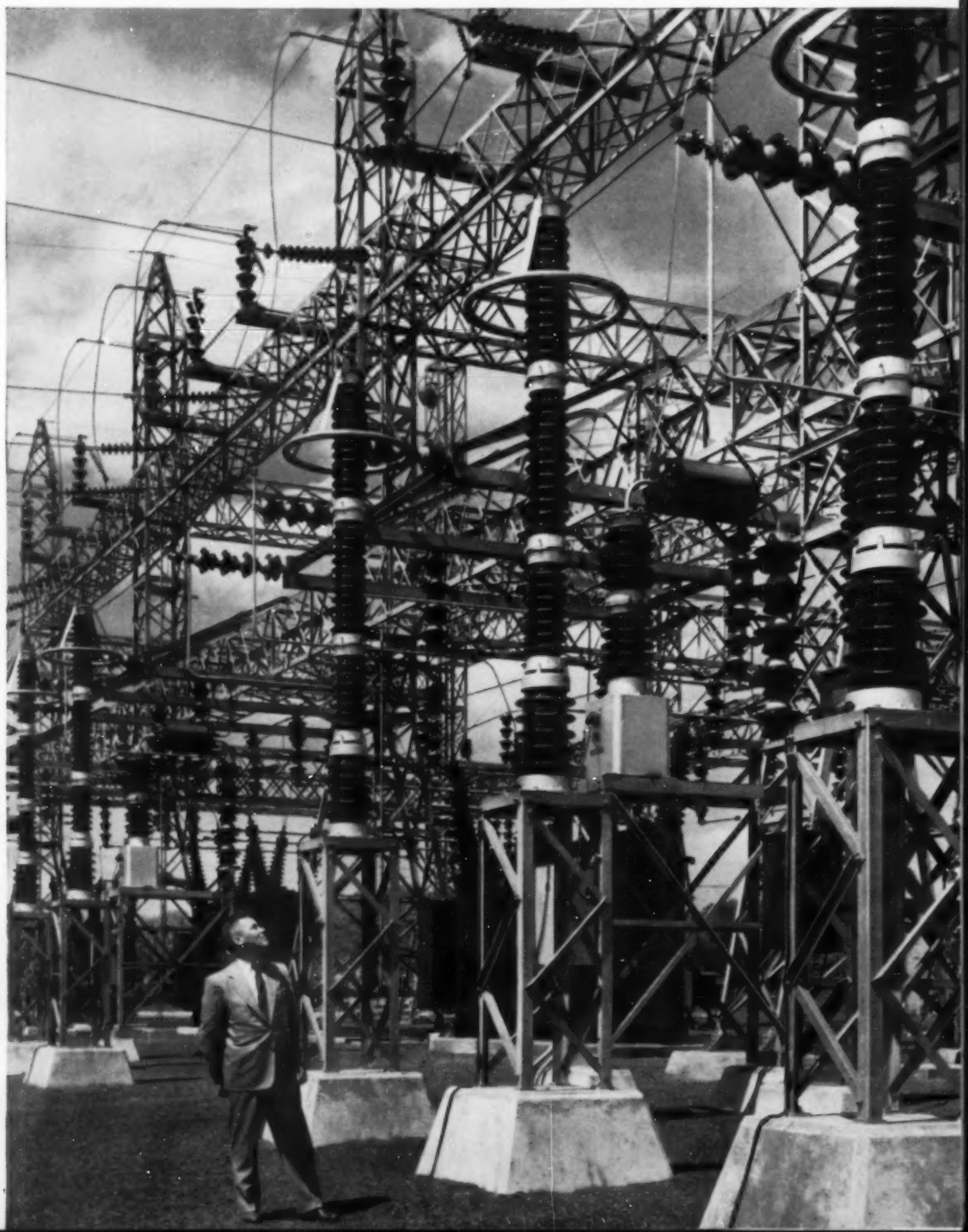
"Package within a package" is this 34.5-kv unit which supplies the area surrounding Marlowe Substation. Shown in the foreground are Westinghouse Type SL station service transformers protected by BA De-ion® power fuses.

YOU CAN BE SURE...IF IT'S

Westinghouse

From penciled diagram to an "on-the-line" substation . . . with

"It went up so easily," said Doc Miller, Construction Foreman of Potomac Edison, "we thought there must be a catch to it. *There wasn't!*" The reasons why Marlowe Substation "went up easily" are good ones. From the time that W. C. Feaster handed Nick King a simple penciled diagram of basic requirements, the coordinated sequence of events occurred like this:



one source . . . Westinghouse

First, complete drawings arrived at Potomac which showed the general layout of Marlowe Substation. Details were included which permitted Doc Miller to begin building foundations. Loading calculations showing thrusts and mechanical stress data showed exactly how much concrete to use.

Equipment drawings then arrived to enable Doc to build pads and arrange for all connections including those underground.

The complete station structure came in on schedule and Doc Miller and his crew erected it using detailed erection drawings which accompanied it.

Power circuit breakers were next on the scene so that they could be placed with the crane which had been used to erect the steel structure.

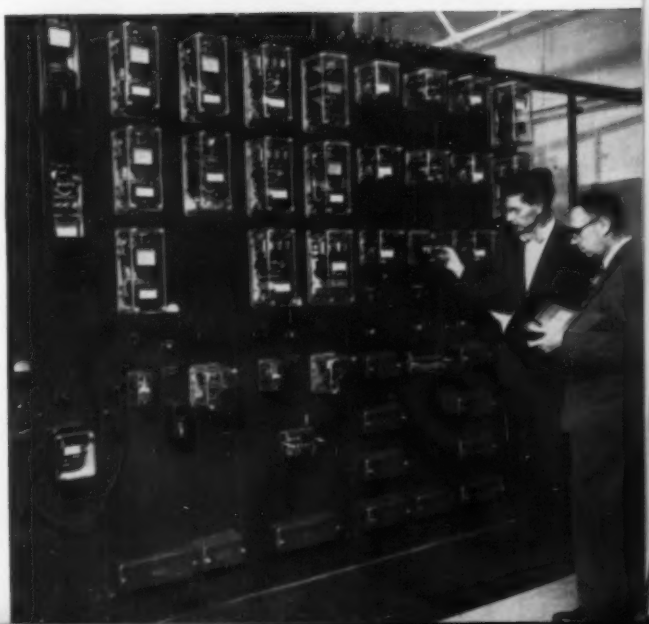
Final delivery of all remaining equipment including a 40,000-kva "Form-Fit" power transformer, lightning arresters, disconnecting switches, power fuses, instrument transformers, line traps and many other items was made when Doc was ready for them.

Marlowe Substation including communication and relaying apparatus was energized on July 30, 1953—well ahead of schedule.

H. B. Pitzer, Potomac Edison Communications Engineer, at a Westinghouse Type FB microwave radio assembly operating in the 952 to 960 megacycle band. Three repeater stations are used over 70 miles of mountainous terrain to Ridgeley Station at Cumberland, Maryland. Four voice channels, two telemetering, one VHF radio control and one test channel are in use at Marlowe.

W. C. Feaster describes operation of pneumatic mechanism of a Type GM-4-A, 138-kv class circuit breaker to E. E. "Ed" Hays, Substation Operator at Marlowe. The Type AA-10 pneumatic operating mechanism shown is capable of high-speed, 3-cycle opening and 20-cycle reclosing with minimum shock to parts.

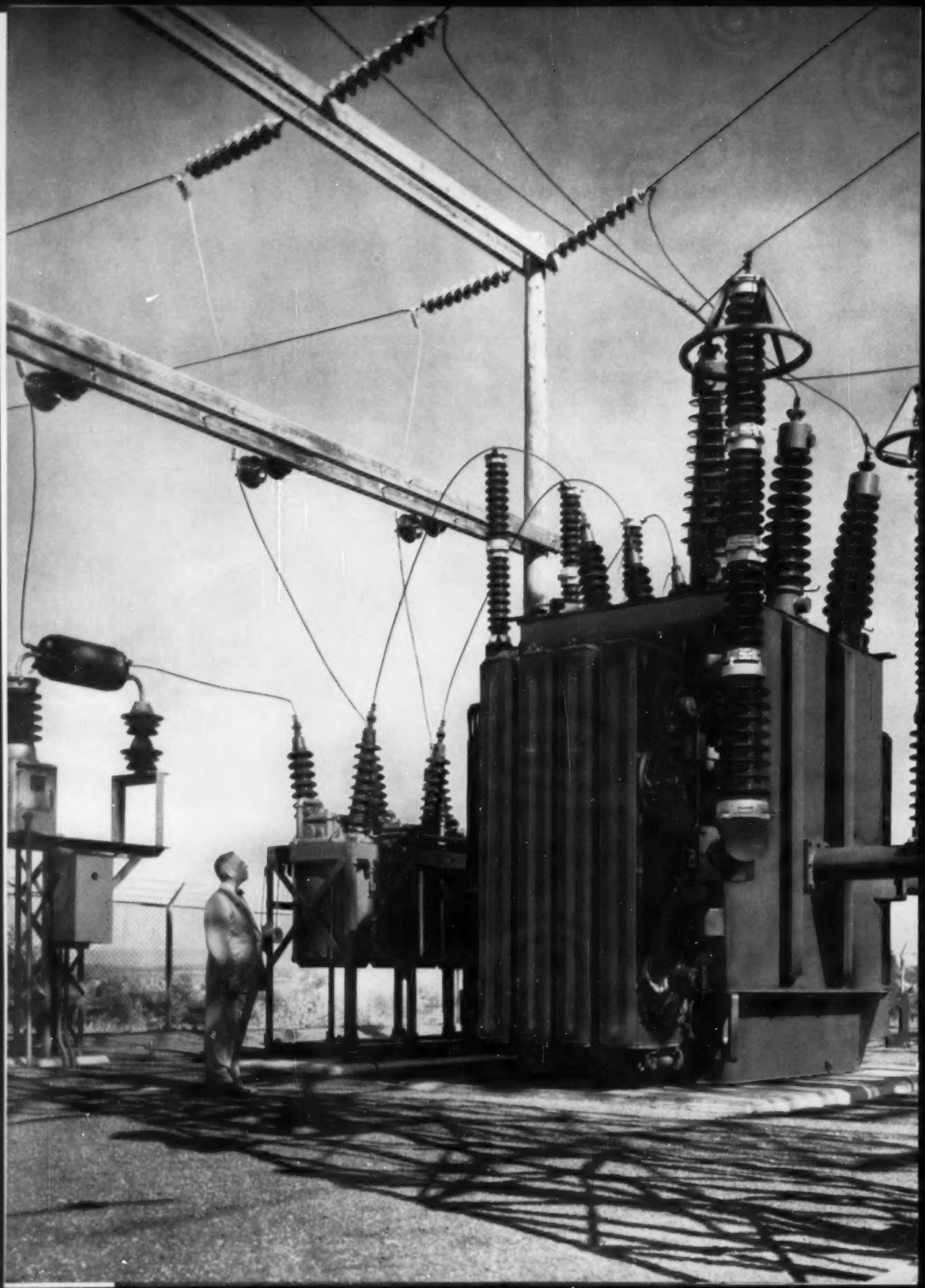
E. R. Cushen, Test Engineer, and Charles Morrison, Planning Engineer of Potomac Edison, at power line carrier relay panel. The first three sections of this panel include Types CR, HKB, HZM and HRP relays for protection of 132-kv lines. The last two panels include Types CA-5, LC-2 and CO relays for transformer and bus protection.



O. L. Wallis, Potomac Edison Assistant Electrical Engineer, inspects Marlowe Substation's Westinghouse station-type Autovalve® arresters which protect the 132-kv equipment. SV arresters will discharge lightning surges of more than 100,000 amperes. They are designed to give the greatest protective margins available in high-capacity arresters.

YOU CAN BE **SURE** . . . IF IT'S

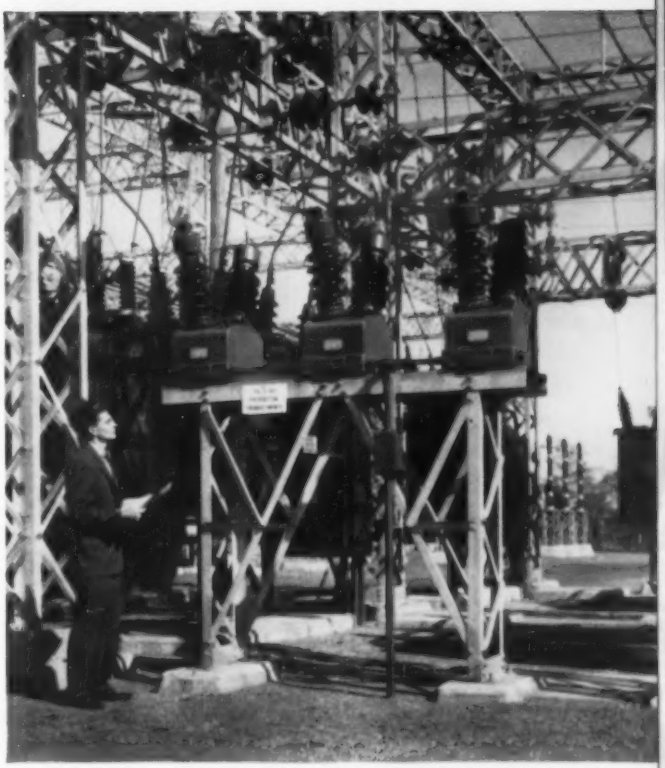
Westinghouse



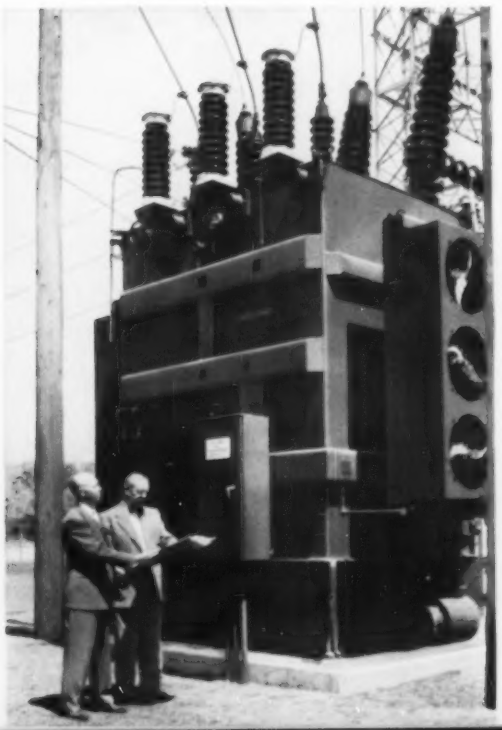
Standardized equipment for Marlowe meant faster delivery... simplified installation... lower costs

Standardized Westinghouse equipment was used throughout Marlowe Substation. It contributed greatly to savings in both time and money because it cut time in engineering, manufacturing, delivery and installation. Doc Miller's construction personnel had no "specials" to deal with.

In addition, the delivery of Marlowe Substation with one order—one supplier—one responsibility—proved conclusively to Potomac Edison executives that substantial savings could be realized while still maintaining rigid standards for reliability and flexibility for future growth. Each component of Marlowe is designed to permit future expansion with minimum changes or additions.



H. H. Startzman at the 69-kv/132-kv, OA/FA Form-Fit power transformer of Marlowe Substation. *Marlowe Substation is the third site for this transformer, since it has been moved with progress of Potomac's 132-kv expansion.* The lighter weight, smaller size and rugged construction of Form-Fit power transformers were distinct advantages to these moves. Note that the SV arresters are mounted on the transformer close to the bushings for maximum protection.



E. R. Cushen checking installation of three Westinghouse OPT, 34.5-kv potential transformers. Westinghouse instrument transformers are noted for reliability and accuracy.

J. N. King and H. H. Startzman, at the 132-kv/34.5-kv Form-Fit power transformer—second largest on Potomac's system. Westinghouse Form-Fit design offers the maximum in mechanical, thermal and dielectric characteristics—at reduced size and weight.

YOU CAN BE SURE... IF IT'S Westinghouse

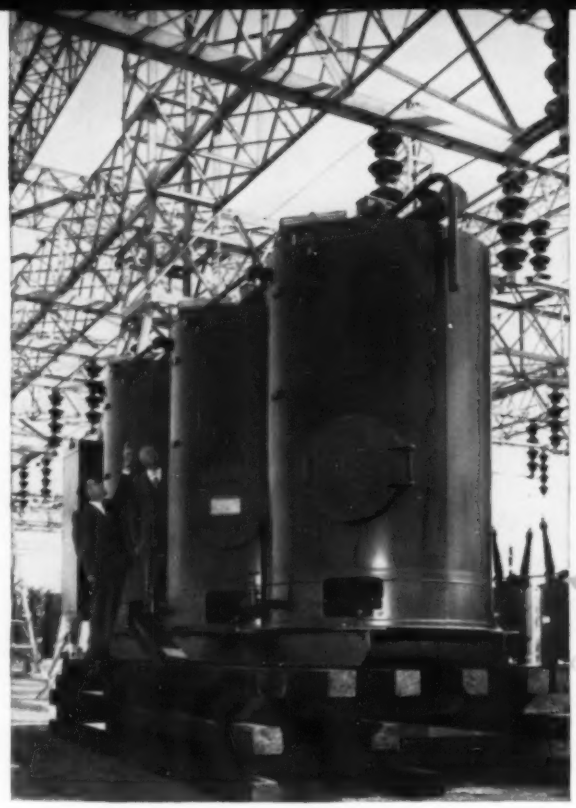
Marlowe Substation is ready for continued expansion

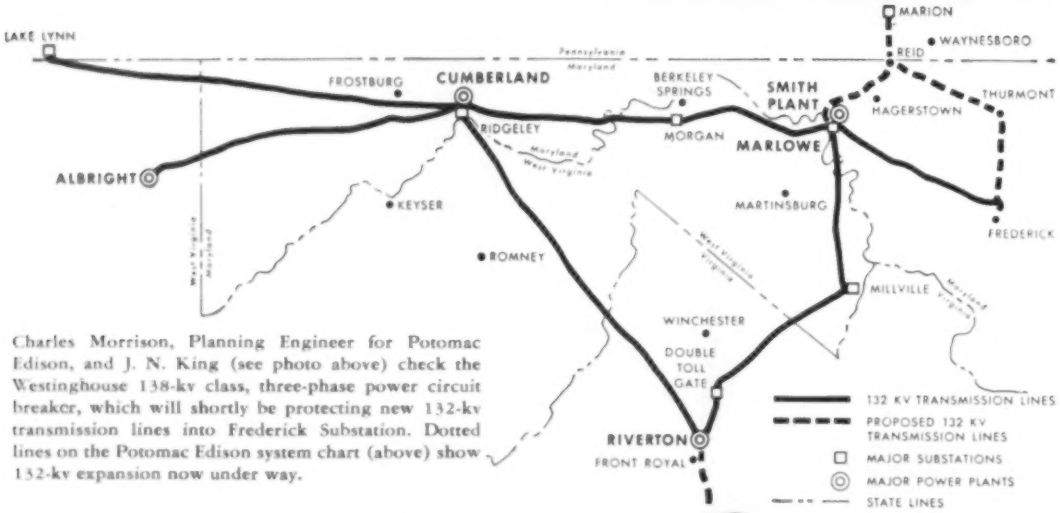
According to H. H. Startzman, Potomac Edison's load in 1933 was 46,350 kw; in 1943, it had jumped to 91,700 kw and 1953 ended with a total of 194,900 kw—more than a 300% increase in twenty years.

With the company actively engaged in all phases of civic and industrial development programs, Potomac Edison is preparing now for at least another 100% load increase by 1963.

Work is under way to extend 132-kv transmission to Marion, Pennsylvania, on the north . . . Thurmont and Frederick, Maryland, on the east, as shown in the system chart below

Marlowe Substation is designed to handle this growth with a minimum of changes and additions—an important factor in Potomac Edison planning. The added advantages of a completely "packaged" substation from one supplier—one responsibility—helped them considerably in meeting their increasing loads economically, without sacrifice of rigid standards of reliability. CP-1023



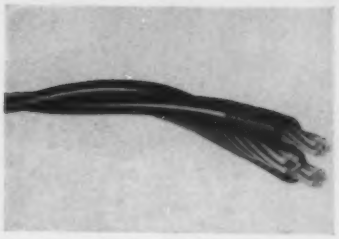


Charles Morrison, Planning Engineer for Potomac Edison, and J. N. King (see photo above) check the Westinghouse 138-kv class, three-phase power circuit breaker, which will shortly be protecting new 132-kv transmission lines into Frederick Substation. Dotted lines on the Potomac Edison system chart (above) show 132-kv expansion now under way.

YOU CAN BE **SURE**... IF IT'S **Westinghouse**

Get complete product data on all products shown from booklets listed at right. Available through your local Westinghouse representative, or by writing direct to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

☐ Power Circuit Breakers	B-4012 / B-5834
☐ Power Line Carrier	B-5873
☐ Microwave	B-5850
☐ Power Line Carrier Relays	LL 41-600.3 / DB 41-412
☐ Power Transformers	B-4142-A
☐ Instrument Transformers	PL 45-000
☐ Line Traps	DB 49-620
☐ Disconnecting Switches	B-4726
☐ Power Fuses	B-5469



Service Drop Cable

Service drop cable has a tight 0.005-in. sheath of nylon covering its tough polyethylene insulation. This increases the impact and the wear resistance of TreePlex cable by more than 50 times as compared with standard Rome Triplex service drop cable. It enables servicemen to install the cable directly through heavy trees without tree-trimming or tree guards. Duplex, triplex, and quadruplex cable is available with copper or aluminum conductors spiralled about neutral messengers of copper, Copperweld, ACSR, or aluminum. Conductor sizes range from 8 to 2 Awg for copper, 6 to 2 Awg for aluminum. Illustrated is a triplex type cable with two aluminum conductors and an ACSR neutral messenger.

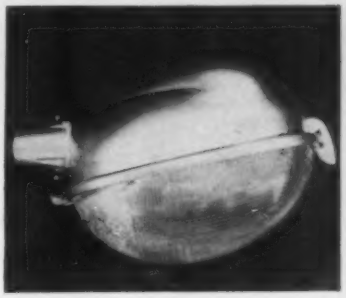
Rome Cable Corp, Rome, N. Y.

Pole Tongs

Saw tooth grips, called Trip Pole Tongs, have a compression of 38% of the lifted object's weight. The tongs can be loaded and unloaded with a trip line by a hoist or crane operator, thus eliminating any hazard to the operator.

Designed to last a lifetime, the tool is said to accelerate pole and timber handling by as much as 50%. These trip pole tongs are made in two sizes, No. 20 (right) with a 10,000-lb capacity, and No. 30 (left) with a 20,000-lb capacity. No. 20 has an 11½-in. opening, and weighs 20 lb. No. 30 has a 16-in. opening, and weighs 30 lb. Both tongs have three teeth on each side, and are manufactured of high tensile 67,000 psi steel.

Hogg and Davis, 2590 E. 67th St, Long Beach, Calif.



Mercury Luminaire

Improved optical performance, more-even illumination on the pavement, and more light on the street are said to be the advantages of the Form 400 mercury street lighting luminaire. Using five different lamps, the luminaire is equipped with hinged glassware to speed maintenance. Reflector and glassware can be removed without tools.

General Electric Co, Schenectady 5, N. Y.

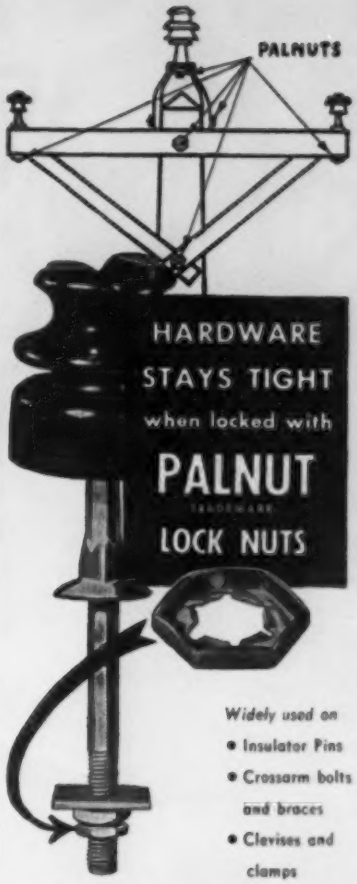
Lineal Heater

A lineal heater for 120 v ac has been developed to prevent freeze-up of water pipes, pumps, roof valleys, eaves and house gutters.

Available as a tape or as single-strand loop, Line-O-Heat can be pounded, knotted, and soaked yet will keep water from freezing when temperatures dip to −50 F, the manufacturer stated. The heaters are pliable enough to wrap around a finger yet strong enough to serve as electric tow cables.

Rated at 5 w per ft, the tape is available in 3, 6, 12, 20, 40, and 60-ft lengths. Loop is rated at 2.5 w per ft and is made in 6, 12, and 24-ft lengths.

(*Continued on page* 220)

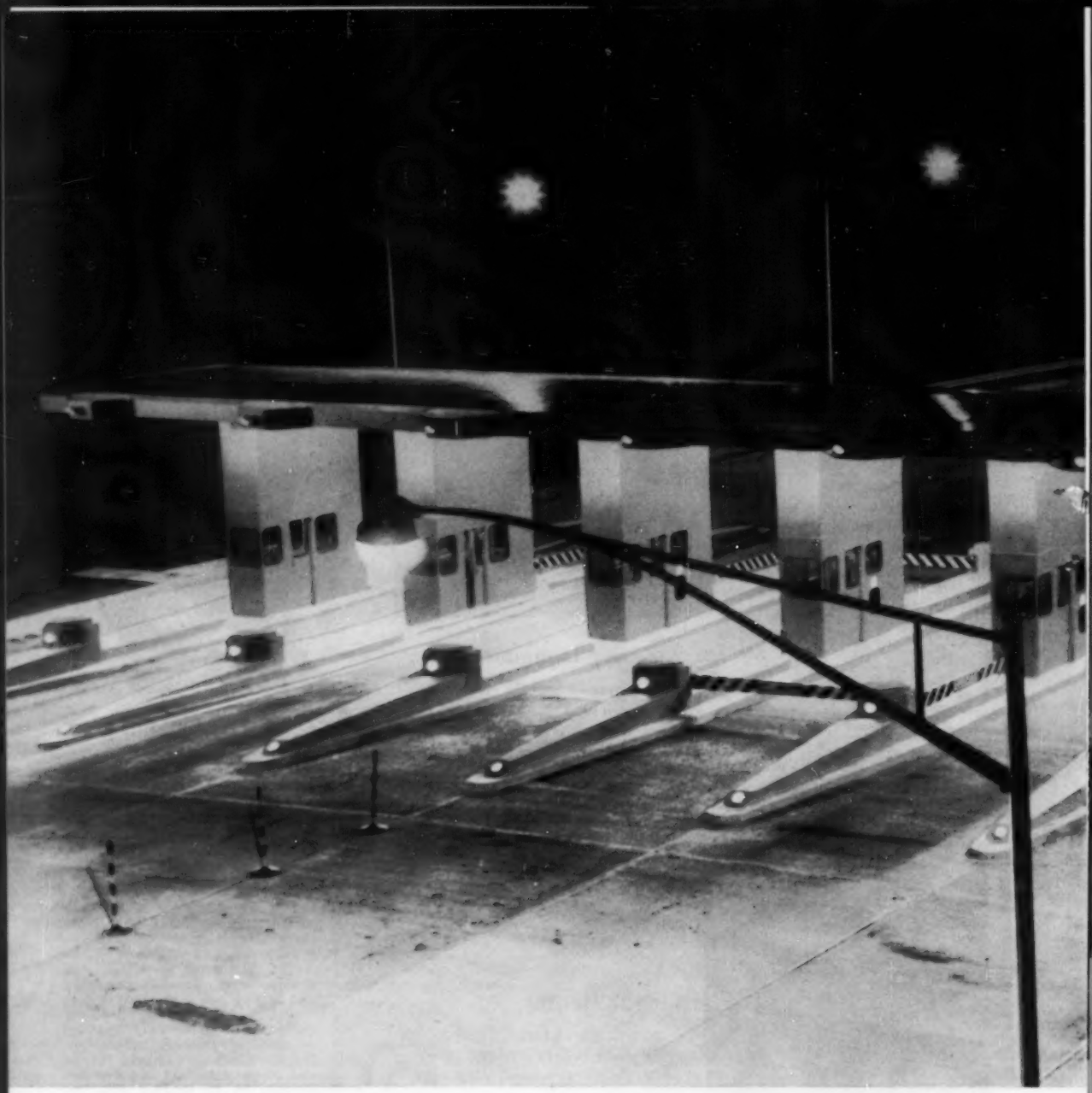


- Eliminate checking and re-tightening
- Eliminate radio interference due to loose hardware

Every bolt-and-nut assembly locked with PALNUT Lock Nuts stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the regular nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied—require little space—may be used on new or existing assemblies. Hot dip galvanized, silicon bronze and other materials and finishes. Stocked by all leading pole line hardware manufacturers.

The PALNUT Co.
51 Cordier St.
Irvington 11, N. J.

PALNUT
TRADE MARK
LOCK NUTS
for quick, secure fastening at low cost



They're cutting the cost of superhighway

- Their light weight cuts installation costs
- They require no initial or maintenance painting
- They have high visibility for maximum safety
- There's a complete absence of seams and joints
- They're spun from aluminum alloy, heat treated for maximum structural strength
- They're designed to fit your individual requirements

One of the keys to safer superhighways is better lighting. And for every phase of turnpike lighting there's a HAPCO Standard to fit the job. HAPCO Poles are sturdy enough for the heaviest duty, yet maintain harmonious beauty with their surroundings. They retain a silver gray beauty, resistant to virtually all atmospheric conditions. Their long life without maintenance makes the investment in HAPCO Poles pay off in the long run.

Be sure to call your Hubbard representative for assistance in specifying street lighting standards, traffic signal pedestals, flood lighting standards, and related equipment. You can order Hubbard products through more than 200 leading electrical distributors throughout the United States.

lighting with HAPCO Aluminum Standards

FREE HAPCO CATALOG. If you'd like more details on design features and specifications of the complete HAPCO line, write for this new free catalog. It contains valuable information to help you plan the most efficient, most beautiful highway and street lighting, as well as any other outdoor lighting requirement. Hubbard Aluminum Products Company, 6301 Butler Street, Pittsburgh 1, Pa.

HUBBARD ALUMINUM PRODUCTS COMPANY

Division of Hubbard & Company
Pittsburgh 1, Pa.

Here's how you can enjoy extra profit dollars with

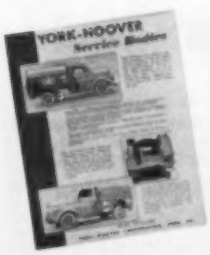
YORK-HOOVER
Model 4986
SERVICE BODIES

THE MODEL 4986 SERVICE BODY is an especially well-designed service and repair body, engineered to be installed on a standard ¾ to 1 ton chassis.

THE PRIMARY PURPOSE of the Model 4986 Service Body is to speed up maintenance and repair work by contributing an orderly method of carrying necessary tools and materials.

STURDY, ALL-METAL CONSTRUCTION provides rugged durability—a factor that enables the Model 4986 Body to "take it" for everyday service work.

COST-SAVING EFFICIENCY is the end result . . . the reason why for over 60 years York-Hoover Equipment has maintained a high record of performance, low operating and maintenance costs.



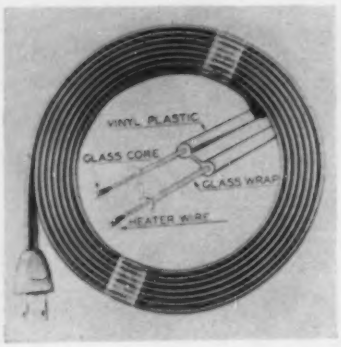
Get the facts! Write for a FREE copy of Bulletin No. 934 today.

YORK-HOOVER
PUBLIC UTILITY BODIES

YORK-HOOVER CORPORATION
BODY DIVISION
YORK, PENNSYLVANIA

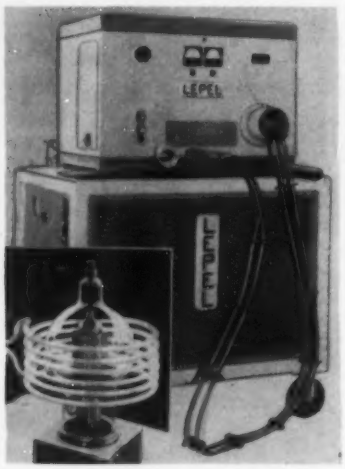
New Equipment

(*Continued from page* 217)



Resistance wire is spiraled on a glass core, over which is placed a double reverse wrapping of Fiberglas. The assembly is then covered with a high-temperature vinyl plastic jacket to yield moisture resistance and low-temperature flexibility.

Smith-Gates Corp, Plainville, Conn.



Induction Heater

A compact, self-contained high frequency heating unit combines an induction heating generator and a refrigerating water recirculator. The portable device can be used to solder, braze, and heat-treat ferrous and nonferrous metals.

Once filled, there is no water consumption since water in the unit is constantly refrigerated and recirculated. The high frequency generator is designed to permit use of long flexible leads between the unit and the

(*Continued on page* 224)

Springs into Action . . .

THANKS TO BATTERY POWER!

Specify
GOULD PLANTÉ—
The Aristocrat of
Stationary Batteries

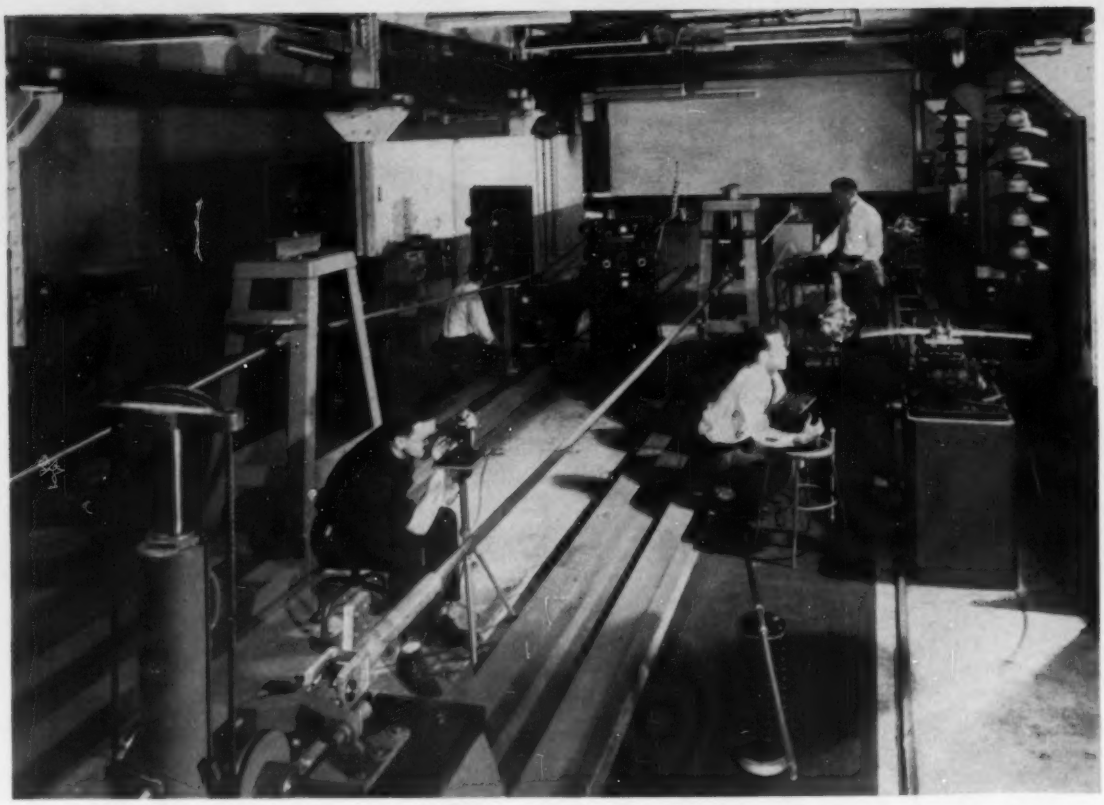
It's mighty satisfying to know the racks in your battery room are filled with Gould's Planté Batteries . . . ready to spring into instant action whenever they're needed. With Plantés, you've got unfailing power for years to come. Many Plantés have been in service 20, 30 years and longer! That's because their positive plates are *pure, solid lead* . . . lead that continually changes into fresh active material throughout battery life. With Gould Planté, float current is minimized, service life is increased, per annum cost is lowered.

Always Use Gould-National Automobile and Truck Batteries

©1954 Gould-National Batteries, Inc.

GOULD
BATTERIES
GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

For Railroad Air Conditioning and Lighting
For Mine Shuttle Cars and Locomotives
For Electric Industrial Trucks
For Diesel Locomotive Starting
For Standby and Emergency Power



Progressive Ideas...

backed by **EXTENSIVE RESEARCH** *and* **SOUND ENGINEERING**

insure the ultimate in **FIELD PERFORMANCE**

The "ultimate in FIELD PERFORMANCE" is the installation that assures the longest satisfactory transmission and distribution line life. In terms of armor-rod function, this means the best protection against line failure caused by:

1 — CONDUCTOR FATIGUE occasioned by a continuing increase in operating and maximum tensile stresses incident to the introduction of stronger conductors and the building of lines with longer and longer spans.

2 — ARCOVER BURNING at or near suspension clamps and LIGHTNING PITTING anywhere along the line.

3 — CORROSION AND CURRENT-TRANSFER PITTING within suspension clamps, at or near taps and under splices.

4 — UNDUE HEATING of taps, splices and so on, caused by the differential expansion of dissimilar metals or of metal stressed beyond its elastic limit.

It is almost impossible, in the case of a line failure, to isolate one or another of the causes, but with Preformed Armor Rods, it is not necessary.

PREFORMED ARMOR RODS by virtue of their inherent and unique characteristics effectively take care of all the above-mentioned problems. Conductors are relieved of mechanical stress at points of support. They are protected against burning, corrosion and overheating, and all of this is done at every point of application with almost unbelievable uniformity and consistency.

Preformed Armor Rods are today's... not yesterday's... answer for increasing conductor life.

For complete details of their outstanding and exclusive features, write or phone Cleveland: EXpress 1-3571.

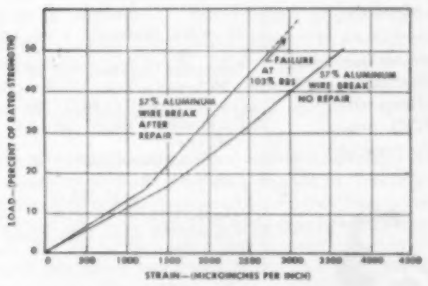
HOW *Preformed Armor Rods* LENGTHEN CONDUCTOR LIFE

★ The most vulnerable spot of a transmission line is under the suspension clamp. You can get no better armor protection than Preformed Armor Rods. They are always *uniform*—always do the same perfect job—factory engineered and factory formed—no variation in installation. Their intimate contact with the conductor provides the necessary reinforcement without any of the rub or chafe between rods and conductor, which you might expect in a looser installation. Furthermore, they will never loosen. They are not dependent on tightening of bolts which might crush the conductor if improperly applied—and which may become loose.

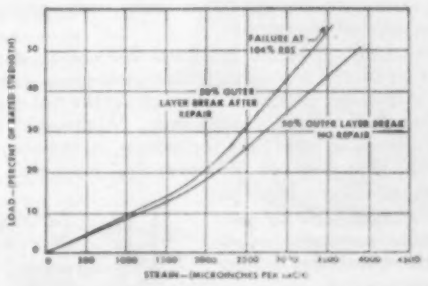
But this is only part of the story: While Preformed Armor Rods will provide the *best* and *safest* protection, they have another *unique* function—they do a job which only Preformed Rods can do. Regardless of armor efficiency, some vibration damage may occur. Should a strand failure occur at the suspension point, Preformed Rods will automatically take on the load, restoring strength and conductance—thereby continuing and lengthening conductor life.*

After all, your interest is in maintaining service—in continued functioning of your transmission lines. You need no longer consider the life of your conductor jeopardized by a strand failure. Preformed engineering has seen to this.

* Many have encountered vibration, chafing and burning failures on unarmored conductors and have used Preformed Armor for repairing and restoration of conductors at those points.


LOAD—(PERCENT OF RATED STRENGTH)
STRAIN—(MICROINCHES PER INCH)
FAILURE AT 103% RBS
37% ALUMINUM WIRE BREAK AFTER REPAIR
37% ALUMINUM WIRE BREAK NO REPAIR

Strength restoration of No. 4, 7 x 1 ACSR (rated breaking strength—2288 lbs.) by Preformed Armor Rods.

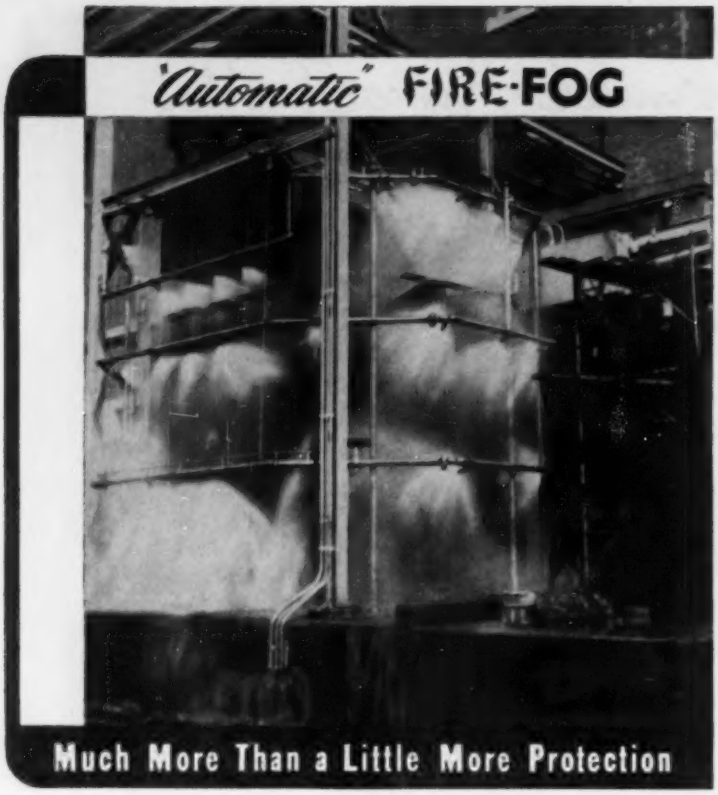

LOAD—(PERCENT OF RATED STRENGTH)
STRAIN—(MICROINCHES PER INCH)
FAILURE AT 104% RBS
20% OUTER LAYER BREAK AFTER REPAIR
30% OUTER LAYER BREAK NO REPAIR

Strength restoration of 795 MCM, 26 x 7 ACSR (rated breaking strength—31,200 lbs.) by Preformed Armor Rods.

These two charts tell the story. Irrespective of conductor size and construction, the clamping characteristics of PREFORMED Armor Rods result in restoration of the strength of damaged conductors to within at least 5 per cent of the rated breaking strength of the original conductors. And remember . . . only with PREFORMED Armor Rods . . . can laboratory tests accurately predict field service performance. There are no "average" installations.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO



With each new installation (photo shows water flow test on 50,000 KVA transformer*) "Automatic" FIRE-FOG establishes its ability to extinguish electrical fires faster, safer and more economically than any other method.

Heat sensitive rate-of-temperature-rise thermostats detect fire within seconds of its origin. Scientifically designed spray nozzles discharge mist-fine "Automatic" FIRE-FOG throughout the fire area. Extinguishment is complete — final. Significantly, "Automatic" FIRE-FOG protection is always in readiness for instant, automatic action; now — next week — next year, or whenever fire threatens.

More detailed information on "Automatic" FIRE-FOG as pertains to your particular needs is available upon request. Send the coupon.

* Installation for Hartford Electric Light Co., So. Meadow Sta., Hartford, Conn.
Stone & Webster Engineering Corp., Boston, Mass. — Engineers and Constructors.

"Automatic" Sprinkler Corp. of Amer.
Youngstown, Ohio
Please rush copy of Bulletin 64 — Design and Application of "Automatic" FIRE-FOG
Name
Title
Company
Address
City State

"Automatic" Sprinkler
CORPORATION OF AMERICA
YOUNGSTOWN, OHIO
Offices in principal cities of North and South America

New Equipment

(*Continued from page* 220)

work coil. This facilitates work that must be done at a distance from the generator.

Model RRP operates on 110 or 220 v, single phase, and contains a stepless Thyratron power control. This tube permits selection of the proper power output.

Lepel High Frequency Laboratories, Inc, 54-18 37th Ave, Woodside 77, L. I., N. Y.

Impregnating Varnish

A modified silicone dipping and impregnating varnish is said to increase substantially the durability of electrical equipment insulated with Class B components. Called Sylkyd 1400 varnish, it combines bond strength and resistance to moisture, oil and solvents. It has a thermal life of 35 hr at 300 C before the dielectric strength of glass cloth impregnated with it decreases to 200 v per mil. This gives protection against failure due to unusual short-period operating temperatures of 200 C. Other properties are shown in the accompanying table.

1. Dielectric Strength,* v per mil	
Condition C-96/25/50	2130
2. Dielectric Constant* @ 25 C @ 60 cps	
Condition C-96/25/50	3.43
3. Dissipation Factor* @ 25 C @ 60 cps	
Condition C-96/25/50	0.008
4. Flex Life, hr, @ 200 C	1000
@ 250 C	150
5. Specific Gravity @ 25 C	0.96-1.00
6 Viscosity @ 25 C, centipoises	400-800
7. Flash Point, F	90
8. Drying Time, hr @ 150 C, maximum	1

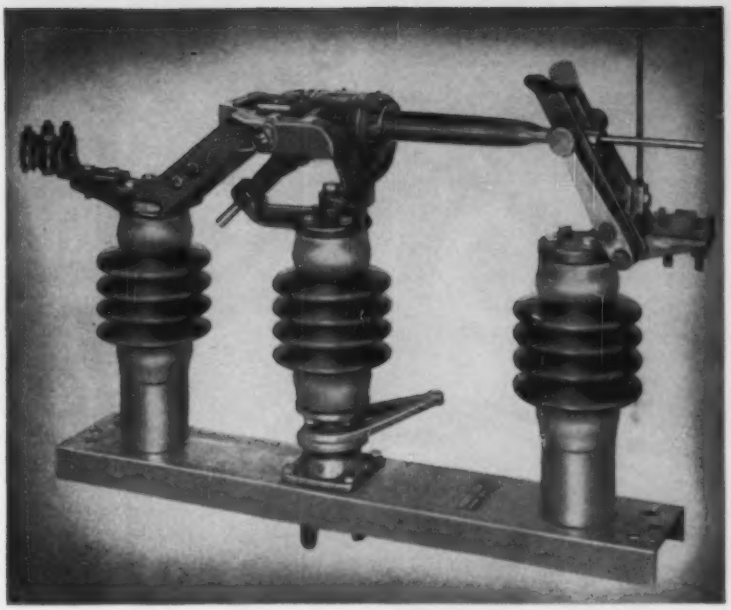
*Measured on varnish-coated Fiberglas cured 16 hr at 150 C.

Dow Corning Corp, Midland, Mich.

Endpoint Indicator

An automatic device now available indicates the end of the operating run of a hydrogen cation exchanger (hydrogen zeolite) unit. Called Enditrol, the device works by measuring the hydrogen concentration of the effluent. By comparing conductivities of the upstream sample and the effluent, it

(*Continued on page* 228)



NEW!

AF20 SWITCH

BY 3E

Vertical Break Switch with Rotating Blade

In this new 3E unit you'll find *all* the best in recent switchgear trends . . . *rotating switch* blade for easy action . . . *high pressure contacts at both ends* . . . heavy silver surfaces *at all contacts* . . . safety lock at both open and closed positions . . . and most important: the combination of these modern features with 3E's reputation for extra-heavy construction and sound design is a real guarantee for years of trouble-free service.

3E Rotating method makes operation unusually easy. In opening, the initial torque is concentrated on rotating the blade. This releases all contact pressure before the blade rises appreciably. Further operation raises the blade to full open position, and is remarkably easy because only the weight of the blade is concerned. This 3E feature eliminates a great deal of the usual abrasion of contacts and stress on the rest of the switch. Many engineers will find this design ideal where switches must be operated when heavily iced.

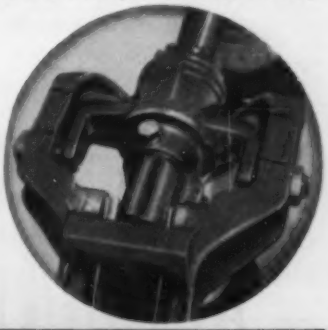
Ideal direct current path. The AF20 is designed for a minimum of contact points . . . and thus a minimum of possible trouble points. A hard-drawn copper blade nestles between identical contact systems at the front and hinge ends; so the current enters and leaves the switch under the same conditions. Contacts are hard-drawn copper bars with heavy silver inlays. Pressure is applied with strong low-stress coil springs.

Important construction and safety features. The smooth action is enhanced by careful selection of vital bearings. The blade rotates in a sealed Oilite bearing unit. A roller bearing is used at the top of the rotating insulator stack and a permanently lubricated, sealed ball bearing at the bottom. The blade locks in both open and closed positions and is over 90° from the contacts when open.

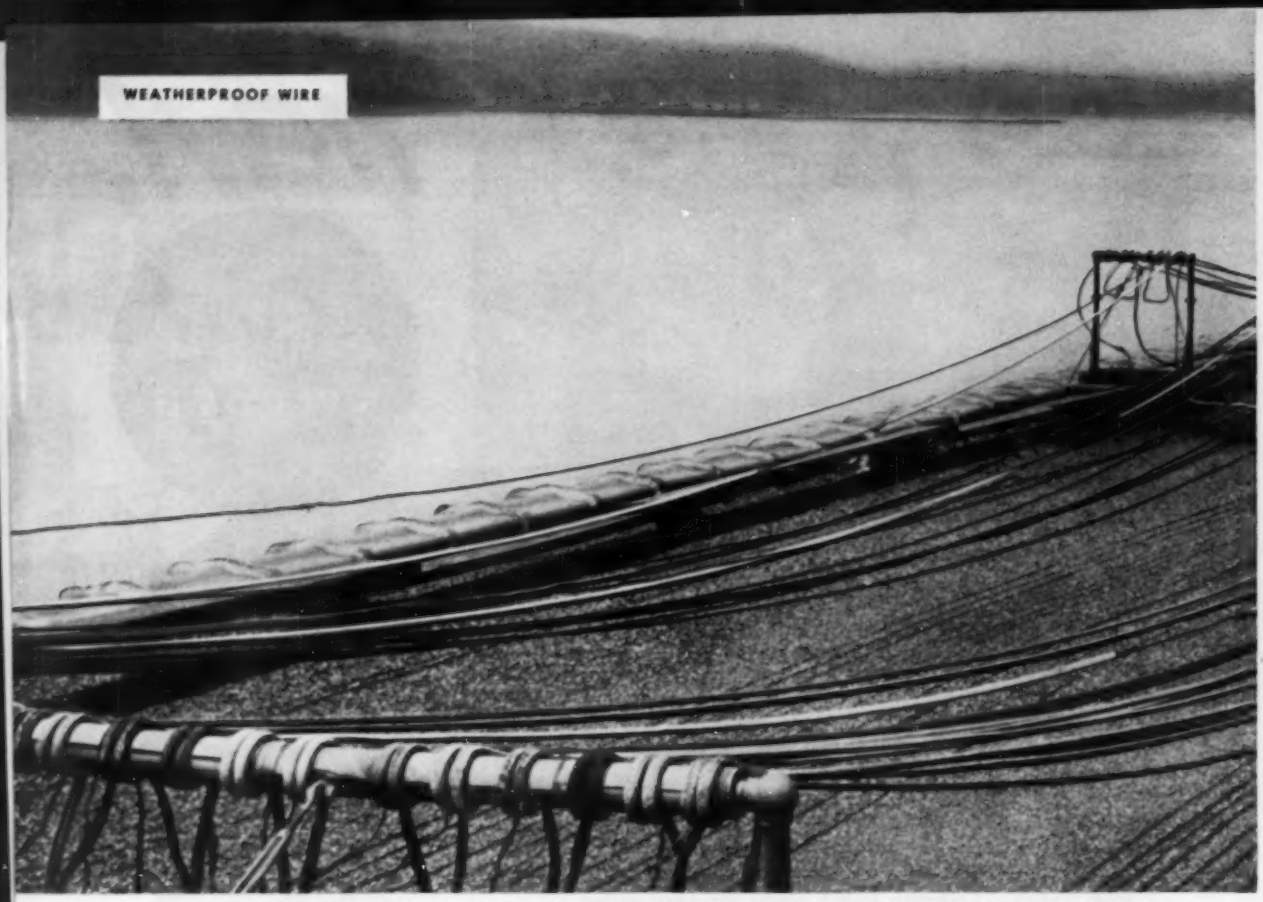
FOR FULL DETAILS WRITE FOR BULLETIN 333

Front contact. Highly flexible system with silver inlays gives ideal contact plus long wear.

Hinge end view. Note rugged construction and 3E's strong, simple blade assembly.



ELECTRICAL ENGINEERS EQUIPMENT CO., MELROSE PARK, ILLINOIS



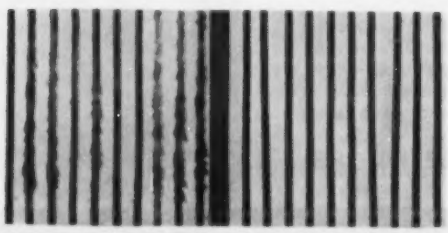
Anaconda's exposure rack at Hastings-on-the-Hudson. This rack is used to study the effects of *natural aging* on wire and

HERE—Duraline passes the toughest

20 years on a torture rack—Duraline licks acrid smoke, salt air, sunlight, ice and snow

How do you test weatherproof wire? By accelerated test in the laboratory? By long exposure to *natural* conditions?

At Anaconda we take both courses. Accelerated tests tell us many things – and tell us quickly. But the most reliable test of all—true, infallible—is *the test of time*.



Some standard types (above), after severe aging test, begin to come apart and festoon.

Unretouched photograph shows that Duraline (above), after exposure to severe aging, remains completely weathertight.

Duraline* is the *one* weatherproof wire that has *passed* this test!

In 1934, hundreds and hundreds of feet of Duraline were installed on special outdoor racks at Anaconda's plant on the Hudson River. In the 20 years since, this wire has been subjected to the most corrosive conditions possible: acrid industrial smoke, salt mist, rain, scorching sun in summer, and ice and sleet in winter.

This wire still stands today. And Duraline shows absolutely *no sign* of deterioration . . .

cable coverings. Duraline—on the rack for 20 years—shows no sign of future festooning.

test of all: THE TEST OF TIME

not the slightest sign of future festooning. This after 20 years!

ALUMINUM OR COPPER

Only Anaconda makes a line wire like Duraline. Your choice of aluminum, copper or copperweld conductor. Ask your Anaconda Salesman or Distributor for full information and an actual sample to look over. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

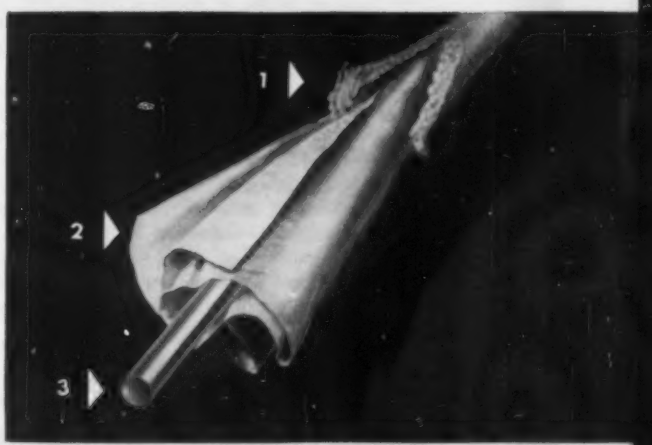
64377

*Reg. U.S. Pat. Off.

DURALINE

WEATHERPROOF LINE WIRE

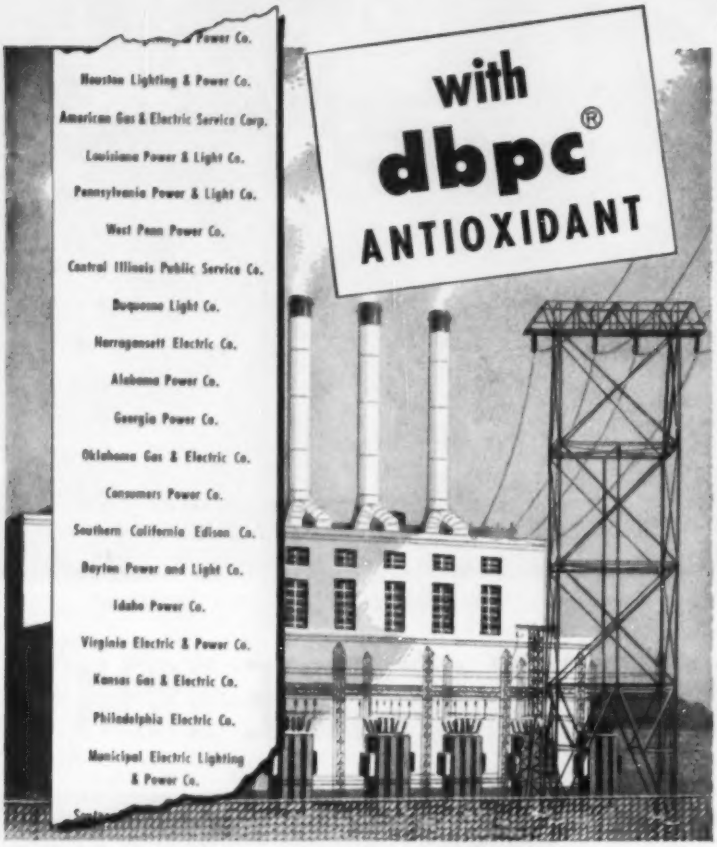
ANACONDA®



Duraline eliminates festooning, and reduces grounds and shorts in wet, windy and icy weather due to contact with foreign objects. The reason is Duraline's unique construction.

1. Outer braid, URC saturated and finished. Experience shows this covering gives finest weather protection.
2. Note *continuous* sheath of interlocked and felted, fibrous material. Water cannot "wick" through it.
3. Aluminum, copper or copperweld conductor.

Lengthen the Life of your Transformer Oil the way these utilities do . . .



● These are only a few users and the list is growing constantly. More and more major utility companies are realizing that for peak efficiency, high-load transformers demand a sludge-free insulating oil. **dbpc** (di-tert-butyl-para-cresol) is the answer, since it greatly increases the resistance of transformer oils to oxidation and keeps sludge formation to a minimum. Accelerated field tests show that new transformer oil, treated with 0.3% of **dbpc**, *lasts three to five times longer than untreated oil.*

Take a tip from the utilities that use this product. Convert to **dbpc**. Besides the solid form it is available as IMPRUVOL 20®, liquid inhibitor. Either can be used in transformers and circuit breakers. Write us for additional information.

KOPPERS COMPANY, INC.

Chemical Division, Dept. EW-1245, Pittsburgh 19, Pennsylvania

KOPPERS®

Koppers Chemicals

SALES OFFICES: NEW YORK · BOSTON · PHILADELPHIA
ATLANTA · CHICAGO · DETROIT · LOS ANGELES

New Equipment

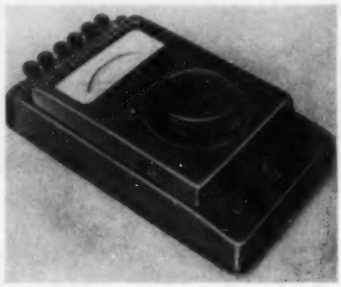
(*Continued from page* 224)

determines whether the downflow hydrogen zeolite ion exchanger is approaching exhaustion.

When equipped with proper controls, it can automatically start regeneration equipment, and signal the end of the operating run by ringing a bell or switching on an indicator light. Automatic operation of regeneration equipment eliminates dangers of over-running and wastes of the chemicals and water due to under-running.

This control device also may be applied to anion exchangers used to remove silica. In this process, anions are taken up in a preferential manner by the ion exchanger bed.

Permutit Co, 330 West 42nd St, New York 36, N. Y.



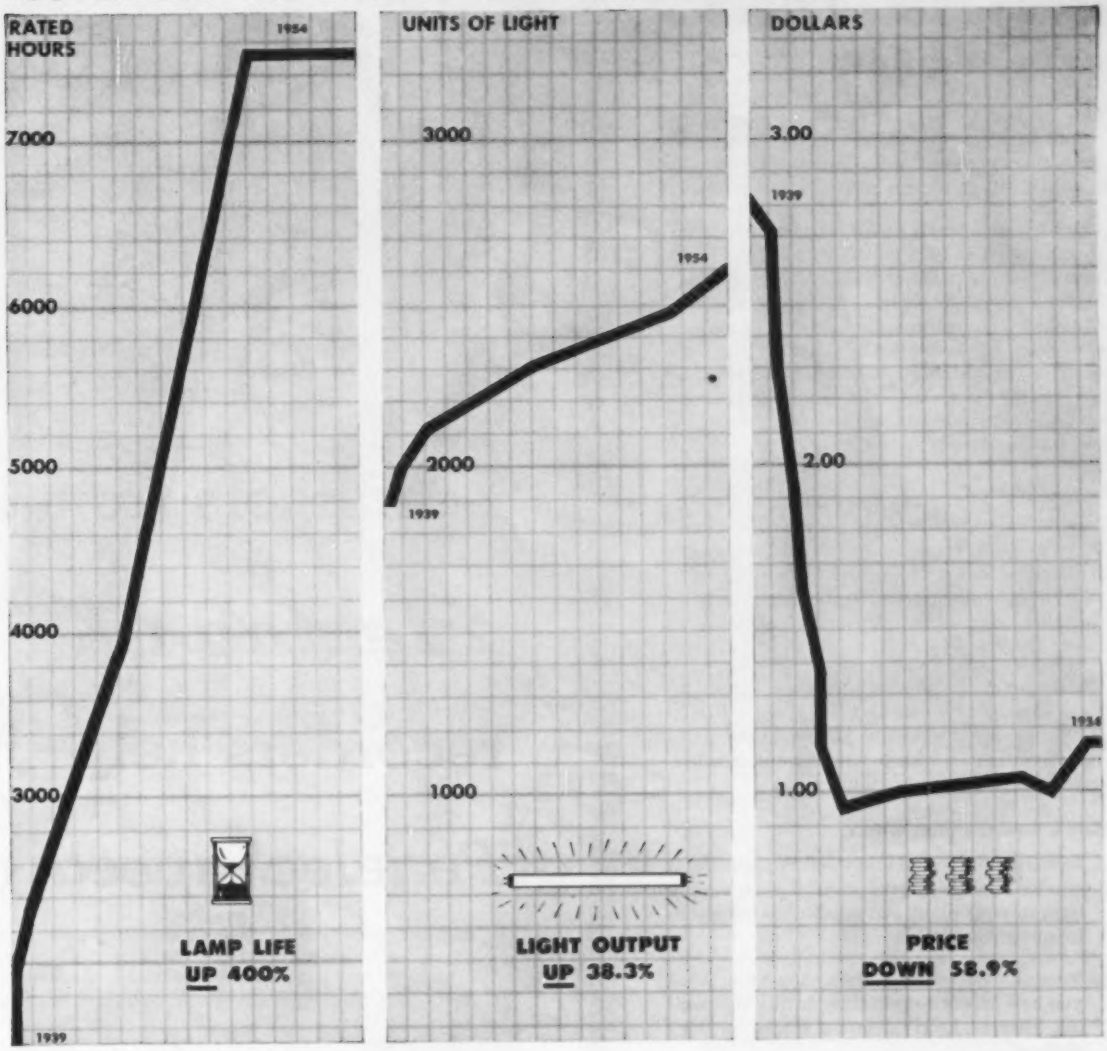
Vector Meter

AEG Vectormeter II, used in Germany for the design of transformers, motors, mechanical rectifiers, and magnetic amplifiers, is now available in the United States. It measures real and reactive current in a circuit to determine phase angle.

The instrument has a switch with an adjustable cut-in point and cut-in time which is used with a moving coil millivoltmeter. The switch is run by a synchronous motor (45-65 cps) which operates from the same power source as the variables to be measured. By checking the current in phase with a voltage, a direct reading of the real component is obtained. By measuring the current 90 degrees out of phase with the voltage, a direct reading of the reactive component is obtained. By finding the relative angles of zero net current for different variables, their phase angles

(*Continued on page* 232)

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



16 times more value for your fluorescent lamp dollar than in 1939

Today you don't have to pay more than $1.15 for the finest fluorescent lamp made: General Electric. Sixteen years ago it would have cost you $2.80 or $1.65 more. And while price has been going down, we've been pushing quality up. General Electric has upped light output 38%, increased lamp life 400%.

In terms of what you really judge lamps by, a General Electric 40-watt fluorescent lamp that lists at $1.15 today is a *16-times bigger value than it was in 1939.*

For further information, contact your G-E lamp supplier or write to Lamp Division, General Electric, Department 166-EW-1, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

How to spend less for expendables

Day after day, week after week, your instruments steadily use up charts, inks, thermocouple wires, tubes, wells—all the expendable accessories that require regular replacement.

If you've been buying your supplies on a hand-to-mouth basis, you're missing out on some sizable savings. Honeywell has developed a modern purchasing plan that gives you new economy, convenience, and quality. This new plan provides assistance in selecting the right supplies and sets up a custom-fitted schedule for buying that will cut your inventories, simplify your purchasing, and save you a big percentage of your annual bill.

New HSM Plan

Foundation of this new plan is your Honeywell Supplies Man. He is trained in the Honeywell factory and has a broad and thorough knowledge of instrumentation. A full-time supplies specialist, your HSM gives you personalized, expert service.

These men are strategically stationed throughout the country to serve you. They will help you plan your purchases to get maximum quantity discounts . . . keep your inventories balanced and always up to date.

Here's how the plan works

1. ***Survey plant***—Your Honeywell Supplies Man checks annual consumption of each supply item in your plant and establishes minimum inventory needs.
2. ***Detail requirements***—He then shows you what you can expect to purchase during the coming year to keep adequate stocks on your shelves.
3. ***Assist in selection***—He keeps you up to date on newest developments, and recommends specific types of equipment wherever your present buying can be improved.
4. ***Estimate savings***—Next, he prepares a blanket annual order, grouping like items to get the biggest quantity discount. Savings may run as high as 50%.
5. ***Schedule deliveries***—Finally, he arranges a regular delivery schedule that assures that you will always have adequate supplies on hand.

Give your Honeywell Supplies Man a call. He's at your local Honeywell office . . . as near as your phone.

Load facts from *ElectroniK** recorders help "*Penelec*" speed

Hilltop dispatcher's office is linked by microwave and carrier telemetering channels with each of the system's generating stations and tie points. One of the microwave relay towers stands at left behind the station.

*Trade Mark of the Minneapolis-Honeywell Regulator Co.

*Dispatcher's-eye view of complete system power. **ElectroniK** instruments on the dispatcher's board in Penelec's new Hilltop Station record power generated by each of eight steam and hydro plants, total system generation, and tie line interchange, and system frequency.*

system dispatching

THE minute-to-minute task of balancing changes in system load with immediate adjustments in generation and interchange has been greatly simplified at Pennsylvania Electric Company, with the completion of new centralized dispatching facilities. By means of microwave and carrier telemetering channels, vital data on station outputs, tie line interchange and frequency are brought to a single operating panel. Here these facts are accurately recorded by *ElectroniK* instruments which show the system dispatcher exactly what is happening throughout the entire power distribution and generation network.

A glance at this battery of instruments tells the dispatcher instantly everything he needs to know in order to make immediate and accurate decisions. Freed of the limitations of telephoned data, he can assign generation wherever it can be taken most efficiently . . . and thus preserves overall economy at a high level. The clearly defined trends shown on the *ElectroniK* instrument charts help the dispatcher recognize trends, and anticipate operating conditions. Human errors in observation and communication are practically eliminated.

The versatility of *ElectroniK* instruments is demonstrated by the varying types of equipment with which these instruments operate in this installation. For the telemetering of individual station generation, the recorders work in conjunction with Westinghouse Type IM telemetering receivers. Interchange at the Roxbury tie point with Metropolitan Edison is transmitted to a General Electric Type TF telemeter receiver and displayed on an *ElectroniK* instrument.

The flexibility and dependability of *ElectroniK* instrumentation can serve your own system control requirements. Your local Honeywell sales engineer will be glad to discuss your specific needs . . . and he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for Catalog 1521, "*ElectroniK* Recorders". . . and Catalog 80-2, "Supervisory Instruments for Steam Power Generation."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

DUXSEAL®
plugs 'em quick and tight

DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package, for smooth, workmanlike jobs.

Duxseal stays plastic—will not slump, melt or run under ordinary temperatures. Clings to duct walls and cables but flexes with expansion and contraction. It is unaffected by water and gases, does not react with rubber, metals or painted surfaces. For full information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

JM

Johns-Manville
SEALING COMPOUNDS

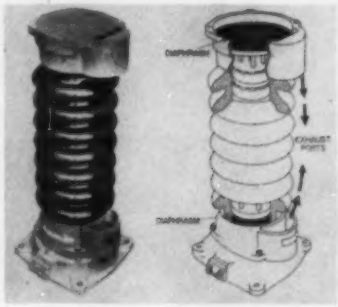
New Equipment

(*Continued from page* 228)

can be measured to 0.2 electrical degree.

New uses have been suggested for the meter. They include dynamic testing of selenium rectifiers, lining up auto-transformers, and determining the firing times of tubes. The meter is made by Allgemein Elektricitaets-Gesellschaft of Frankfurt/Main, West Germany.

Donald C. Seibert, Importer, Box 281, Wilmington, Del.



Lightning Arrester

A station-type lightning arrester has exhaust ports that act as a pressure-relief safety device should the arrester lose its ability to limit or interrupt power flow. The arc is transferred to the outside of the porcelain housing within one-half cycle of fault current to prevent rupture of the porcelain housing by arc-generated gases.

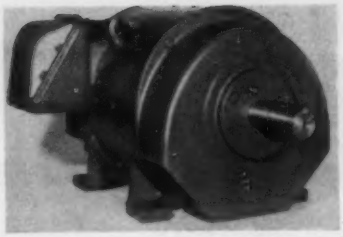
The Type SV station arrester is applicable on 3 to 330 kv. Maximum impulse sparkover values have been decreased to improve equipment protection.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Hydraulic Winch

A lightweight hydraulic winch can be installed on trucks and other vehicles where power take-off openings are not available. Remotely controlled, it gives precise control of loads, and eliminates shock-loading through its smooth hydraulic action. Its power source can be situated at a distance.

Tulsa Winch Div, Vickers, Inc, Tulsa, Okla.



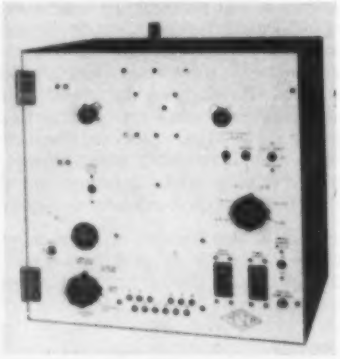
Industrial DC Motors

Industrial dc motors are especially designed for "automatic factory" applications requiring quick reactions to demands for changes with "dynamic response."

For example, Super-T-Line motors are suited for a steel mill that operates a flying shear, traveling 2,200 fpm, to cut bar stock into 81-ft lengths with an accuracy of 0.5 in. For each cut, the motor is accelerated to a precise speed, stopped, and repositioned in 1.7 sec.

These standard-design motors are reported to be rugged, can take overloads, can change speed rapidly, can maintain torque and tension, and can start and stop quickly. Engineers attribute these qualities to lower mechanical and electrical inertia, and higher commutating ability. The motors range from 20 to 100 hp and are rated for a maximum 60 C rise. Totally enclosed motors are rated for 75 C rise. Bulletin C-2002.

Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio



Meter Test Board

A test board for polyphase watthour meters combines the low heat dissipation of artificial or phantom loading with the high power factor inherent in pure resistance loading.

(*Continued on page* 237)

HYDROGEN COOLING SYSTEMS INCREASE THE EFFICIENCY of these two 20,000 kw G-E turbine-generators at Lake Superior District Power Company, Ashland, Wisconsin. Reading is being taken at the control panel.

Higher efficiency of G-E hydrogen cooling system lowers turbine-generator fuel costs

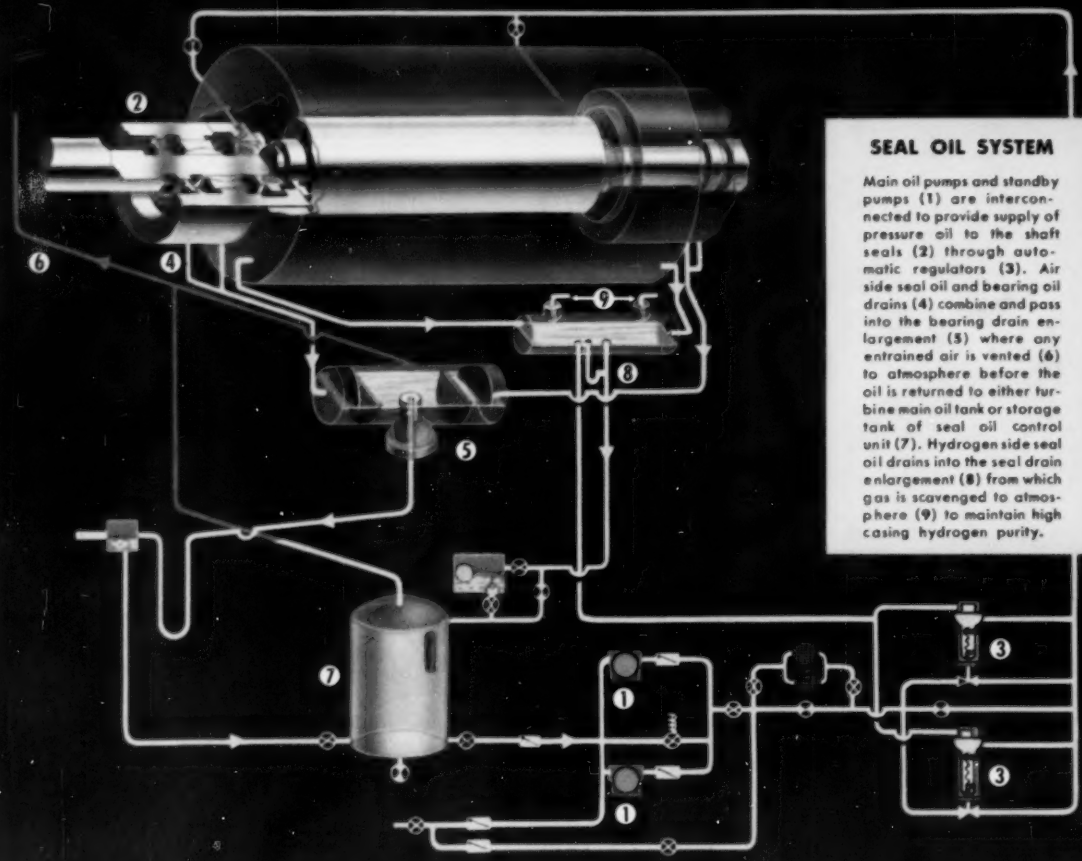
On General Electric turbine-generators in the size range of 15,000 to 40,000 kw, hydrogen cooling can provide full load efficiency from ½ to 1 per cent better than air-cooled machines of equivalent ratings. Thus, the benefits of hydrogen cooling, which for years has been built into larger-size G-E generators, can mean substantial annual fuel savings for users of machines in this medium size range.

Hydrogen cooling offers lower losses, cleaner ventilating passages, and minimum corona effect on windings. Fire hazard is less than for an air-cooled machine because commercially pure hydrogen will not support combustion. Superior heat transfer makes for smaller size and weight. The G-E system maintains high hydrogen purity with consumption of hydrogen kept to about 50 per cent of other systems now in use.

Details of this proven G-E hydrogen cooling system are described on the next three pages.

GENERAL ELECTRIC

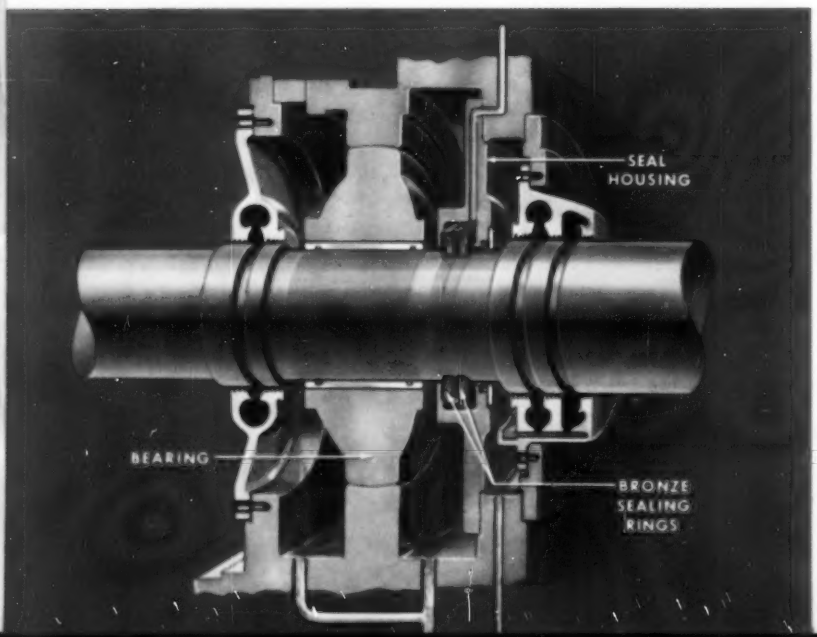
For Details Turn To Following Pages . . .



SEAL OIL SYSTEM

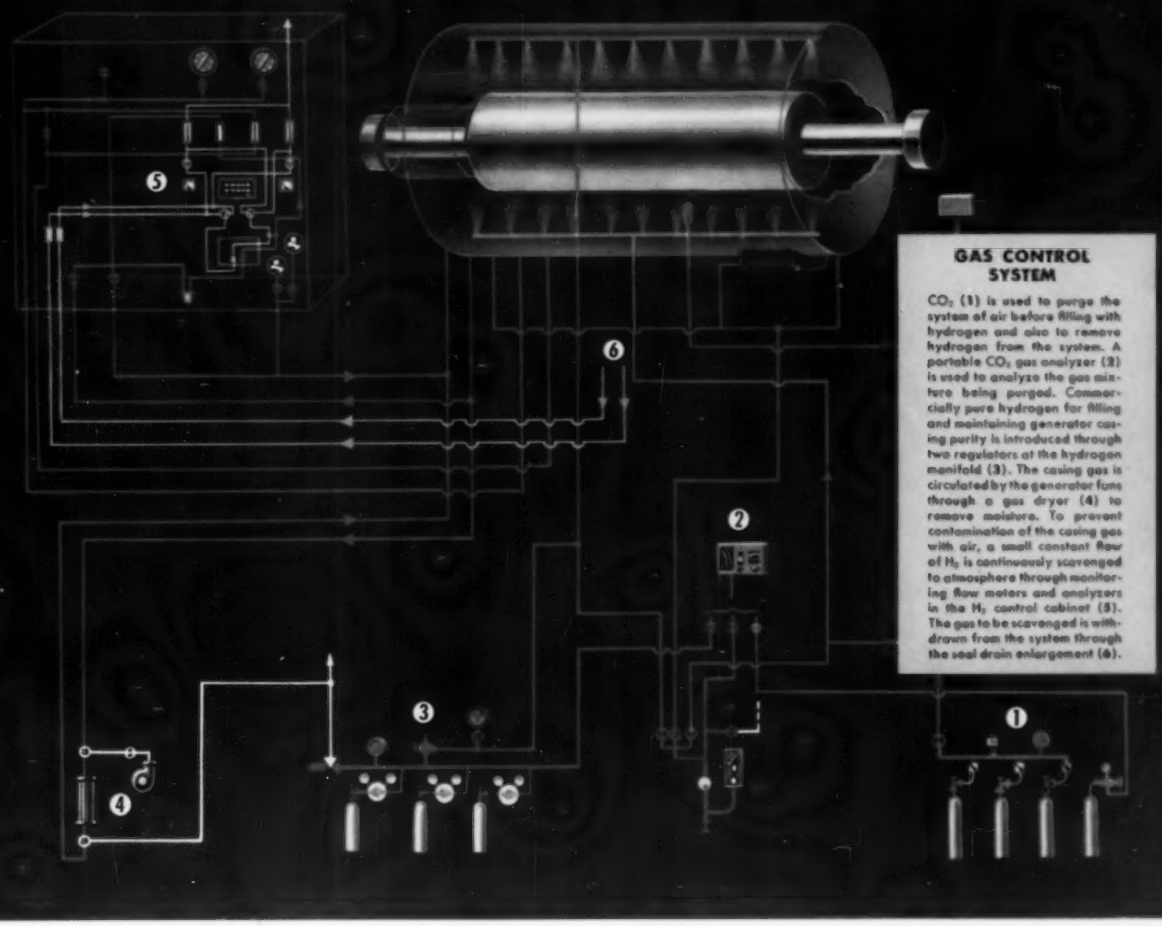
Main oil pumps and standby pumps (1) are interconnected to provide supply of pressure oil to the shaft seals (2) through automatic regulators (3). Air side seal oil and bearing oil drains (4) combine and pass into the bearing drain enlargement (5) where any entrained air is vented (6) to atmosphere before the oil is returned to either turbine main oil tank or storage tank of seal oil control unit (7). Hydrogen side seal oil drains into the seal drain enlargement (8) from which gas is scavenged to atmosphere (9) to maintain high casing hydrogen purity.

Gas stays in, air stays out for high purity



SEAL ASSEMBLY

A seal at each end of the generator prevents the escape of hydrogen from the casing along the rotor shaft. The seal, which is supported from the outer end shield, consists of a pair of bronze sealing rings with an internal diameter just a few thousandths of an inch larger than the shaft diameter. Oil at a pressure of about 5 psi above the hydrogen pressure in the casing is supplied to the seal housing and enters the annular space between the sealing rings. It flows in both directions between the sealing rings and the shaft, preventing the loss of gas. The bearing is entirely external and separated from the shaft seal and may be inspected without removing the gas from the generator.



GAS CONTROL SYSTEM

CO_2 (1) is used to purge the system of air before filling with hydrogen and also to remove hydrogen from the system. A portable CO_2 gas analyzer (2) is used to analyze the gas mixture being purged. Commercially pure hydrogen for filling and maintaining generator casing purity is introduced through two regulators at the hydrogen manifold (3). The casing gas is circulated by the generator fans through a gas dryer (4) to remove moisture. To prevent contamination of the casing gas with air, a small constant flow of H_2 is continuously scavenged to atmosphere through monitoring flow meters and analyzers in the H_2 control cabinet (5). The gas to be scavenged is withdrawn from the system through the seal drain enlargement (6).

and minimum hydrogen consumption

On many recent General Electric hydrogen cooled generators, casing gas purity has been maintained above 99 per cent, with hydrogen consumption as low as 35 cubic feet per day at 15 lb. pressure.

Here's how G-E turbine-generators achieve this performance: The seal assemblies at each end of the generator shaft are fitted so closely that very little oil is required to completely seal off the inside of the generator. Result: Almost no contaminating air is carried into the generator by the seal oil.

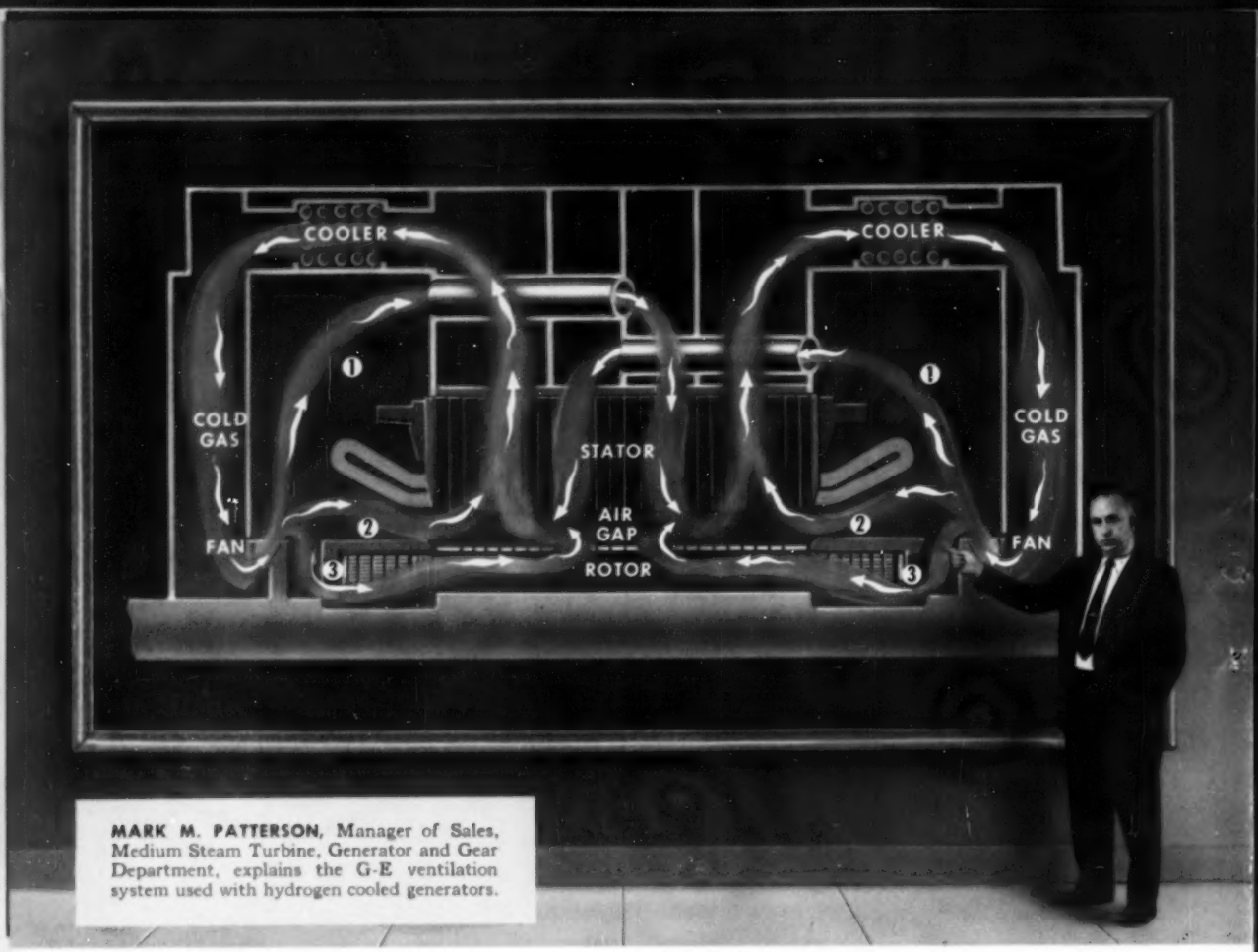
Further, a system of gas detrainers constantly and automatically frees the oil of entrained air and gas as it returns from the generator. This separated air and gas is vented to the atmosphere.

A gas control system feeds the hydrogen into the generator at 99.6 per cent purity and scavenges contaminated gas to maintain constant high casing purity.

Finally, nine automatic protective devices give the operator immediate warning of unusual mechanical or operational condition.

Leader in Turbine-Generator Progress

GENERAL ELECTRIC



MARK M. PATTERSON, Manager of Sales, Medium Steam Turbine, Generator and Gear Department, explains the G-E ventilation system used with hydrogen cooled generators.

G.E. engineers 3-path ventilation sytem for more uniform cooling of entire unit

The superior cooling effect of hydrogen gas is directed throughout the entire unit. Fans mounted at each end of the generator rotor force the cooling gas into three internal paths:

1. **Over the stator end-turns** to passages between the core and wrapper plate, then radially inward through ducts in the laminations to the air gap, and radially outward through adjacent cooling ducts in core.
2. **Over the stator and rotor surfaces** of the air gap and radially outward through cooling passages of the stator core.
3. **Over the rotor end windings,** through internal ventilating ducts of the rotor to the air gap, and through the discharge passages of the stator core.

From the discharge passages of the core, the gas goes to the surface coolers and returns to the inlet side of the fans. The pressure-drops through the passages are balanced to maintain a proper proportion of total gas cooling each path and uniform cooling of the length of the generator. The many advantages obtainable only from the reliable G-E hydrogen-cooling system, as applied to medium-size machines, are primarily due to the engineering advances described on these four pages. There are others and there will be more, because G-E engineers never stop working to make certain G-E hydrogen cooling is the best that can be designed. General Electric Co., Schenectady 5, N. Y. 256-14

Progress Is Our Most Important Product

GENERAL ELECTRIC

New Equipment

(*Continued from page* 232)

This is accomplished through adjustment of a powerstat control that adds the necessary out-of-phase voltage to the current circuit.

Designated Catalog No. 1045, the test board puts a quadrature voltage on the potential coils of both meter and standard when a "Test for Phase Angle" switch is thrown. If the current is exactly in phase with the line voltage, the net power factor is zero and the standard meter will not rotate. A lagging or leading current causes either forward or backward creep of the standard, which is then brought to a full stop with the powerstat control. This calibration insures that current does not lag the cross-phase voltage by more than 60 deg during 50% pf tests.

Eastern Specialty Co, Philadelphia 40, Pa.

Safety Socket Luminaire

Luminaires wth service-safe sockets have been developed for multiple or series mercury-vapor street-lighting circuits. The Ovalite luminaires are designed to yield maintenance economies, speed installation, and reduce hazards of relamping. They are available with refractors for Type III or Type IV light distribution.

Lamp and socket of each luminaire are parts of the hinged refractor assembly and are immediately de-energized and isolated from the circuit as the luminaire is opened. Series luminaires (pictured here) incorporate make-before-break contacts to elminate arcing while maintaining cir-

(*Continued on page* 238)

"Cyclone!...anudder night wasted!"

● Many a promising criminal career has been nipped in the bud by Cyclone Chain Link Fence. When you specify Cyclone, you get Grade A protection. For proof, note that Cyclone is the most widely used property protection fence in the world.

You can buy cheaper fence than Cyclone, but it will cost you more per year. Cyclone gives full value for your dollar. Nothing but brand-new, top-quality material is used throughout. Posts and top rails are heavy and rigid. Gates won't drag. The chain link fabric is woven from heavy steel wire and galvanized *after* weaving for greatest resistance to rust and corrosion. And when Cyclone is erected by full-time, Cyclone-trained experts—your fence will stay trim and good-looking for years.

NO JOB IS TOO LARGE—NO JOB IS TOO SMALL FOR CYCLONE*

CYCLONE FENCE DEPARTMENT, AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
WAUKEGAN, ILLINOIS · SALES OFFICES COAST TO COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Cyclone Fence, Dept. V-15, Waukegan, Ill.
Please send me without obligation, complete information on Cyclone Fence and Gates.
Name .....
Address .....
City ..... State .....

*Cyclone is the trade-mark name of fence made only by Cyclone. Accept no substitute.

USS CYCLONE FENCE

UNITED STATES STEEL

NEW ELECTRO SWITCH CATALOG

A CATALOG OF
Low-cost → *Dependable*

ROTARY MULTIPOLE SWITCHES for INSTRUMENT, TRANSFER, and SELECTOR SERVICE.

ESCO instrument switches permit control of complex circuits with a single compact switch instead of separate switches.

This catalog covers ESCO Type P snap-acting switches, with up to four selector positions, handling 10 amperes at 120 volts a-c, 5 amperes at 240 volts a-c, 3 amperes at 450 volts a-c or 5 amperes at 125 volts d-c, 3 amperes at 250 volts d-c.

The catalog also lists ESCO JR detent-action switches with up to eight selector positions, handling 10 amperes at 125 volts a-c or 5 amperes at 125 volts d-c.

The basic structure of ESCO rotary switches provides for extreme flexibility in design. Tell us your circuit arrangements and the sequences you need, and we will recommend the correct switch for your use.

Write TODAY for your copy of this new catalog.

ELECTRO SWITCH
CORPORATION
Weymouth 88, Massachusetts

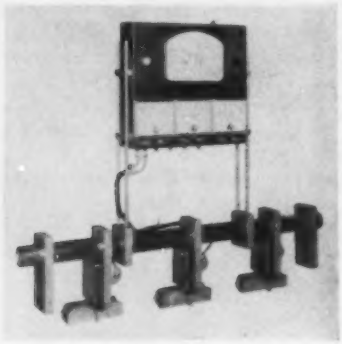
New Equipment

(*Continued from page* 237)

cuit continuity.

Luminaires for multiple circuits accommodate A-H1, E-H1, or C-H5 mercury vapor lamps, or their color-improved versions. Luminaires with the service-safe feature for series circuits take E-H1, and J-H1 lamps. They are adaptable to horizontal or pendant mounting.

Line Material Co, Milwaukee 1, Wis.



Picker Lap Tester

A device that continuously monitors and controls longitudinal and lateral lap thicknesses has been produced for permanent mounting on pickers. The picker lap tester measures and indicates actual weight, minus moisture, as the lap is being produced. Lap unevenness and weight may also be permanently registered by use of a recording device. Both recorder and meters are calibrated to show ounces-per-yard.

Brush Electronics Co, 3405 Perkins Ave, Cleveland 14, Ohio

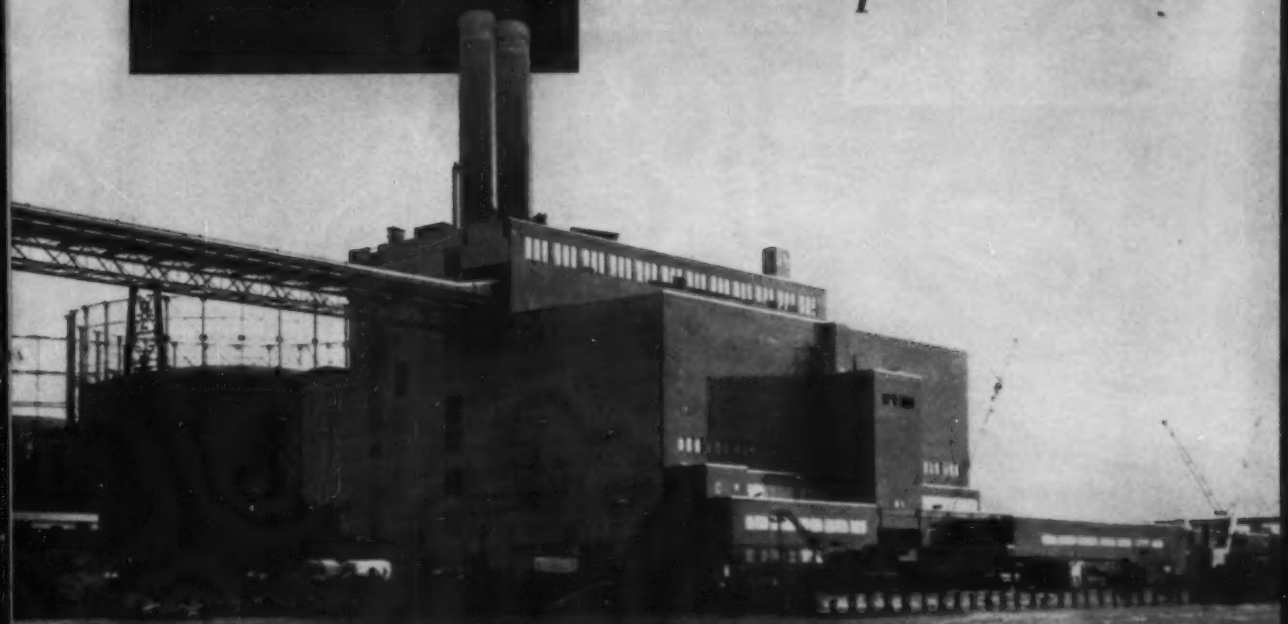
Supervisory TV

Industrial TV equipment has been designed for utilities, industry, and transportation companies to use for remote supervision of plant operation, manufacturing processes, materials handling, and property protection. Comprising a small camera, monitor and camera control, the system is reported to operate on commercial TV standards in a few ft-c incident light, and yields bright pictures with high definition.

(*Continued on page* 240)

DE LAVAL
BARREL TYPE BOILER FEED PUMP

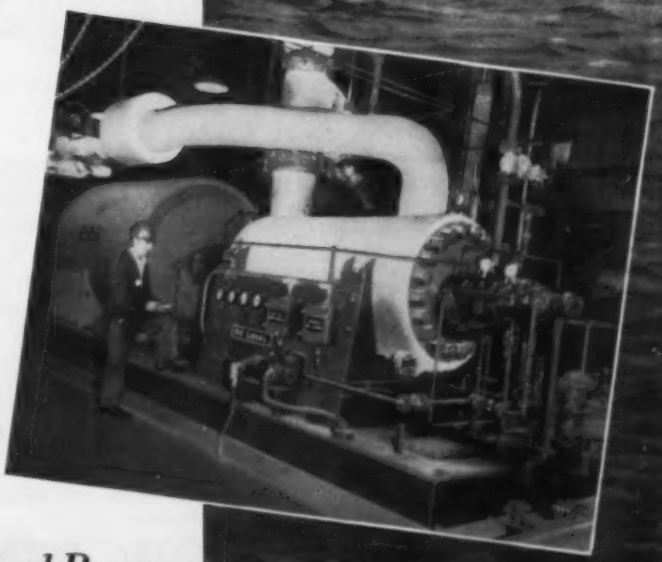
in new Con Edison *Astoria power station*



This De Laval 11-stage barrel type boiler feed pump is now on the line in the new Astoria station of the Consolidated Edison Co. of New York.

The De Laval 8/6 pump operates at 129 psig suction pressure and delivers 1,570 gpm of 344 F water against 2,229 discharge pressure. Direct-connected at the end of the boiler feed pump shaft is a De Laval IMO pump for lubrication of the main pump and motor bearings. Also furnished is a motor-driven De Laval IMO auxiliary oil pump with pressure controlled switches.

De Laval barrel type boiler feed pumps meet all the requirements of high pressure, high temperature boiler feed service. The distinctive De Laval design assures years of reliable operation with minimum maintenance.

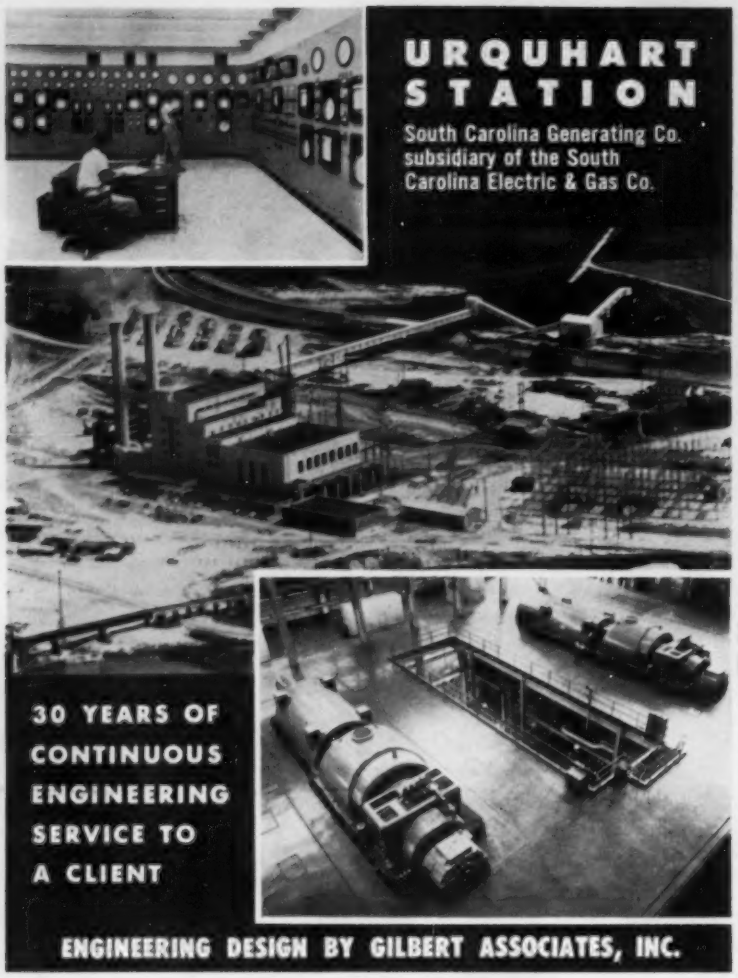


DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY

961 Nottingham Way, Trenton 2, New Jersey

DL 880



ENGINEERING DESIGN BY GILBERT ASSOCIATES, INC.

GAI engineers have assisted the South Carolina Electric & Gas Co. and its predecessor organizations in meeting the every-increasing demand for electrical energy in its territory. Frequent additions to its system facilities have been successfully accomplished and continuing engineering and consulting services on operating problems as well as plant development, the most recent being Urquhart Station, is evidence of client satisfaction.

URQUHART STATION . . .

Maximum rated capacity of Units #1 and #2 is 75 MW each; Unit #3, now under construction, will be 100 MW.

Units #1 and #2 operate at 1450 psig, Unit #3 at 1800 psig with initial steam temperatures of 1000°F and reheat to 1000°F.

The steam generators are fired with pulverized coal and are rated 510,000 lbs. per hour each for Units #1 and #2 and 700,000 lbs. per hour for Unit #3.

This station will produce sufficient energy in one hour, approximately 250 MWH, to provide the electrical requirements of the average home for 110 years.

Initial operation indicates the ability of the station to exceed the rated design capabilities and efficiencies.

GAI

GILBERT ASSOCIATES, INC.
ENGINEERS • CONSULTANTS
607 WASHINGTON ST., READING, PA.

NEW YORK • WASHINGTON • PHILADELPHIA

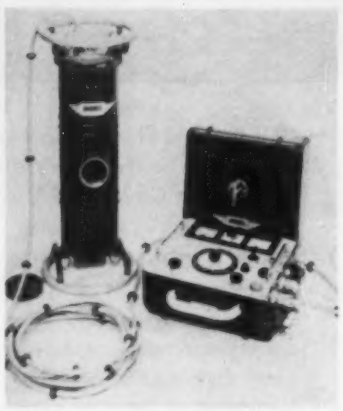
FOR FREE BROCHURE WRITE DEPT. EG

New Equipment

(*Continued from page* 238)

Camera uses a standard 16 mm lens. Camera control, synchronizer and monitor are housed in a cabinet. The camera can be situated 500 ft from control units, and monitors can be several thousand feet from cameras. Several cameras can be driven from one synchronizer.

Philco Corp, Philadelphia 44, Pa.



Portable X-Ray Unit

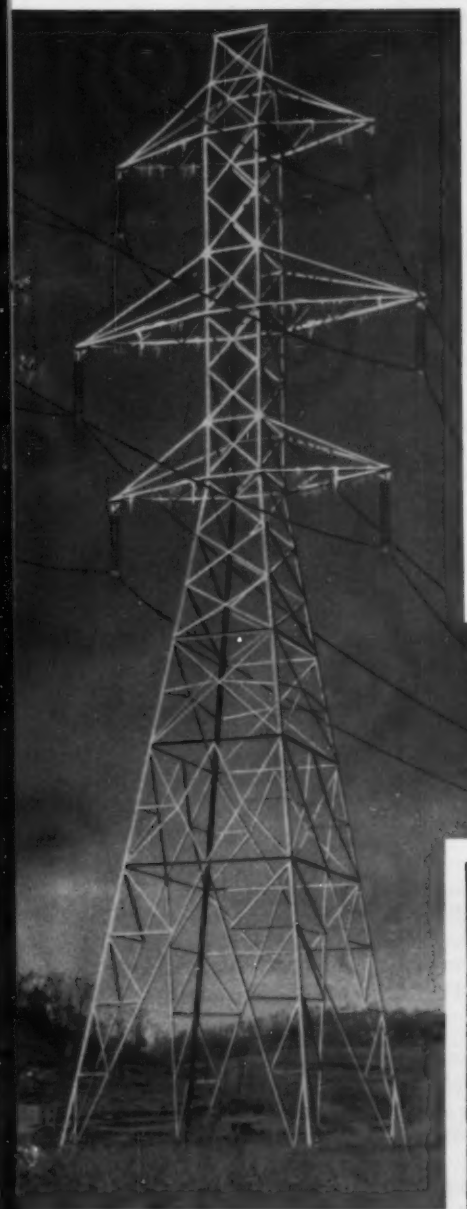
A 160-kv portable X-ray unit, designed for industrial radiography, can penetrate 2 in. of steel. Its components include a 120-lb tube unit, a 60-lb control unit, and lightweight connection and power cables. Operating on 110 and 220 v, independent of separate transformers, its 1.5 mm focal spot in the centrally located tube is designed to give sharp definition in radiographs.

Holger Andreasen, Inc, 703 Market St, San Francisco 3, Calif.

(*More New Products on page* 244)

Transmission Towers

by AMERICAN BRIDGE can "take it"!



FOR STRONGER, weather-worthy transmission towers, you can rely on AMERICAN BRIDGE. It is backed by 44 years of experience in designing and fabricating transmission towers.

The ability of these tall sentinels to withstand the extremes of wind and ice conditions is proof of good design practice. It is this widely recognized and proven ability to "take it" that has won for these strong, dependable towers the respect of power companies everywhere.

American Bridge towers are a *must* for all important high voltage lines. For example, you'll find them along the 330,000-volt, double circuit Appalachian Electric Power Company link of A.G.&E.'s high voltage transmission network. *These towers are approximately 150-ft. tall and are designed for straight line spans of 1700-ft.*

American Bridge towers are made to order for every type of transmission line service. They are designed for simplified erection on level, side-hill, or rocky butte sites. They are engineered for heavy-duty service under the severest climatic conditions. For recommendations based on your specific requirements, just write our nearest office.

Designed to carry any load —to fit any terrain!

Incorporating special design features such as steel grillage earth anchors and variable leg extensions, American Bridge towers make possible important savings in time, labor, and material costs.

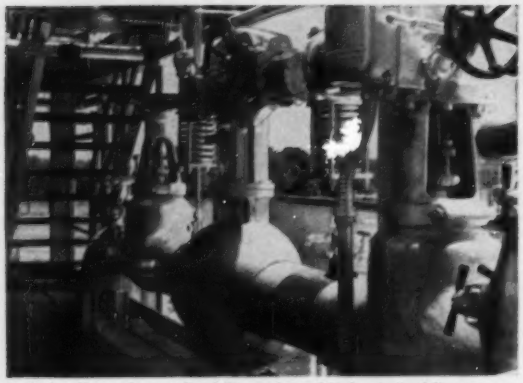
AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO · CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · ELMIRA · GARY MEMPHIS · MINNEAPOLIS · NEW YORK · PHILADELPHIA · PITTSBURGH · PORTLAND, ORE. · ROANOKE · ST. LOUIS · SAN FRANCISCO · TRENTON UNITED STATES STEEL EXPORT COMPANY, NEW YORK

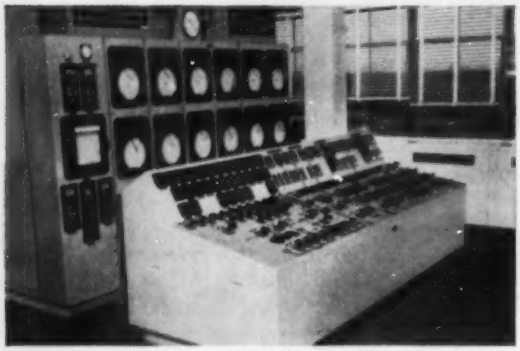
AMERICAN BRIDGE

USS

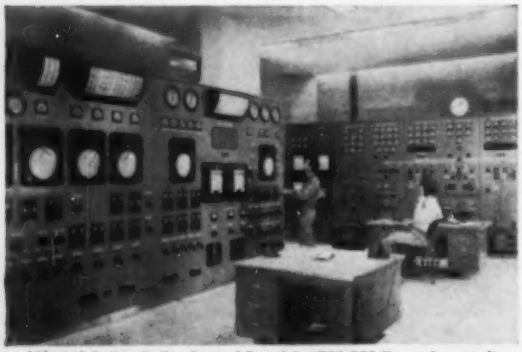
UNITED STATES STEEL



Bailey Three-element Feed Water Control Valve is feed line to a 450,000 lb per hour boiler.

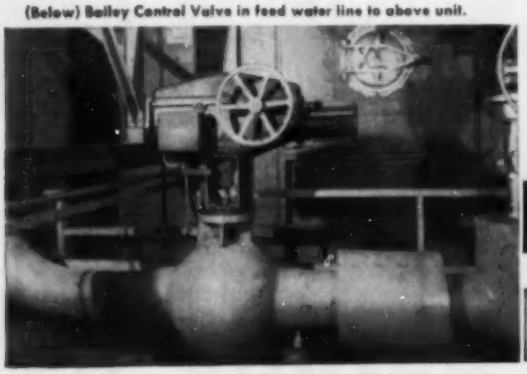


Operator's station for Bailey Three-element Feed Water Control is located in this compact control room.



(Above) Bailey Boiler Control Panel for 750,000 lb per hour unit including Three-element Feed Water Control.

(Below) Bailey Control Valve in feed water line to above unit.



Here's Proof—

Bailey Is Your Best Buy in

More than 1000 large boiler units are equipped with Bailey Three-element* Feed Water Control for close regulation of drum level, added safety, and added efficiency.

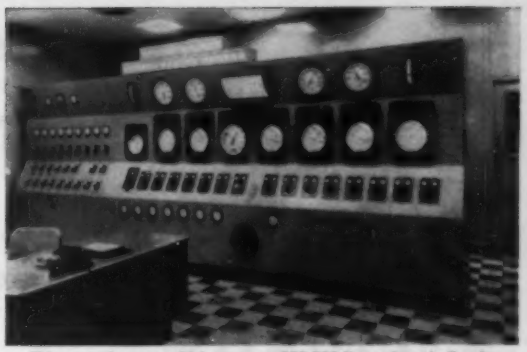
That Bailey is better than a 2 to 1 favorite against the combined total of all other makes used in this service is borne out by checking the 173 steam-electric stations listed by Electrical World in its design issues of May 8, 1950 and April 7, 1952. No wonder we can say Bailey is your best buy.

Such an endorsement by users of power equipment doesn't just happen. It's the result of carefully weighing all factors: design superiority, accuracy of operation, dependability in service, and the experience of the

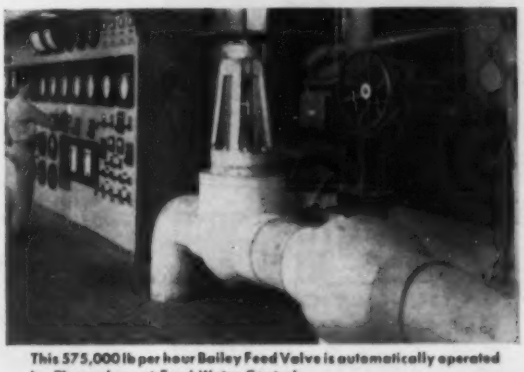
BAILEY METER

1060 IVANHOE ROAD

Complete Controls for



This control room, which serves a 500,000 lb per hour boiler, includes an operator's station for Bailey Three-element Feed Water Control.



This 575,000 lb per hour Bailey Feed Valve is automatically operated by Three-element Feed Water Control.

1000 times!

Feed Water Control

manufacturer in building and servicing this type of equipment.

That's why you should check with users before you buy. And you'll find a Bailey user near you. We couldn't spot over 1000 installations on one small map—but from those we were able to show, you can get some idea of Bailey's universal popularity—and how easy it is to get service with a minimum of travel time and expense. Call your nearest Bailey Office—they will be glad to arrange an inspection tour for you. And if you want catalog information, including a list of users, write for Bulletin 105-C Bailey Meter Company. A-123-2

*The three elements are—1. Steam Flow from Boiler
2. Water Flow to Boiler
3. Water Level in Drum

(Above) Operators' stations for Bailey Three-element Feed Water Control are concentrated in this centralized control room for three 250,000 lb per hour boilers.

(Below) Three-element Feed Water Control is part of the complete Bailey Control System operating two 500,000 lb per hour boilers from this control room.

COMPANY
CLEVELAND 10, OHIO
Steam Plants

COMBUSTION
FEED WATER
TEMPERATURE
PRESSURE
LIQUID LEVEL
FEED PUMPS

OIL IMMERSED, ASKAREL & DRY TYPE TRANSFORMERS
Capacities 1 to 5000 KVA

- POWER
- DISTRIBUTION
- UNIT SUBSTATION
- GENERAL PURPOSE
- PHASE CHANGING
- ELECTRIC FURNACE
- RECTIFIER
- WELDING
- MOTOR STARTING
- SPECIAL

MARCUS transformers have been proven in the field by year after year of safe, trouble-free service. Leading engineers choose them for rugged dependability. At MARCUS there is no compromise with quality. Sound engineering and skilled production result in transformers that have set a new standard for the industry. The MARCUS seal on a transformer is your guarantee that you have bought the best. It is truly *"The Mark of Quality"*.

"Mark of Quality"

Representatives in Principal Cities

—MARCUS—
TRANSFORMER CO., INC.
RAHWAY, NEW JERSEY

MORE NEW PRODUCTS
about which you should know

Safway Steel Products, Inc, 6234 W. State St, Milwaukee 13, Wis., offers a **work tower** on casters to speed construction and maintenance jobs. The tower has an inside walk-up flight of stairs, equipped with non-skid treads, and is credited with a time saving of ⅔ on a window installation job.

Holger Andreasen, Inc, 703 Market St, San Francisco 3, Calif., has a portable **residual-stress analyzer** using the X-ray diffraction method. The "Androscope" distinguishes between tensile and compressive stresses, recording them on film in 10 to 20 min.

Ruge-De Forest, Inc, 50 Moulton St, Cambridge 38, Mass., offers **resistance thermometer element** with a −100 F to + 500 F range. Grid of fine nickel wire is bonded between silicone-impregnated glass fiber fabric, which permits continuous operation at 500 F. Ask for Bulletin T-54.

Demo Tool Corp, 8735 Melrose Ave, Los Angeles, Calif., has Model DL-375S portable **rotary hammer** for drilling holes up to 4 ft long. This 15-in. drill weighs only 9½ lb, and drills holes from 3/16 to 1½ in. dia.

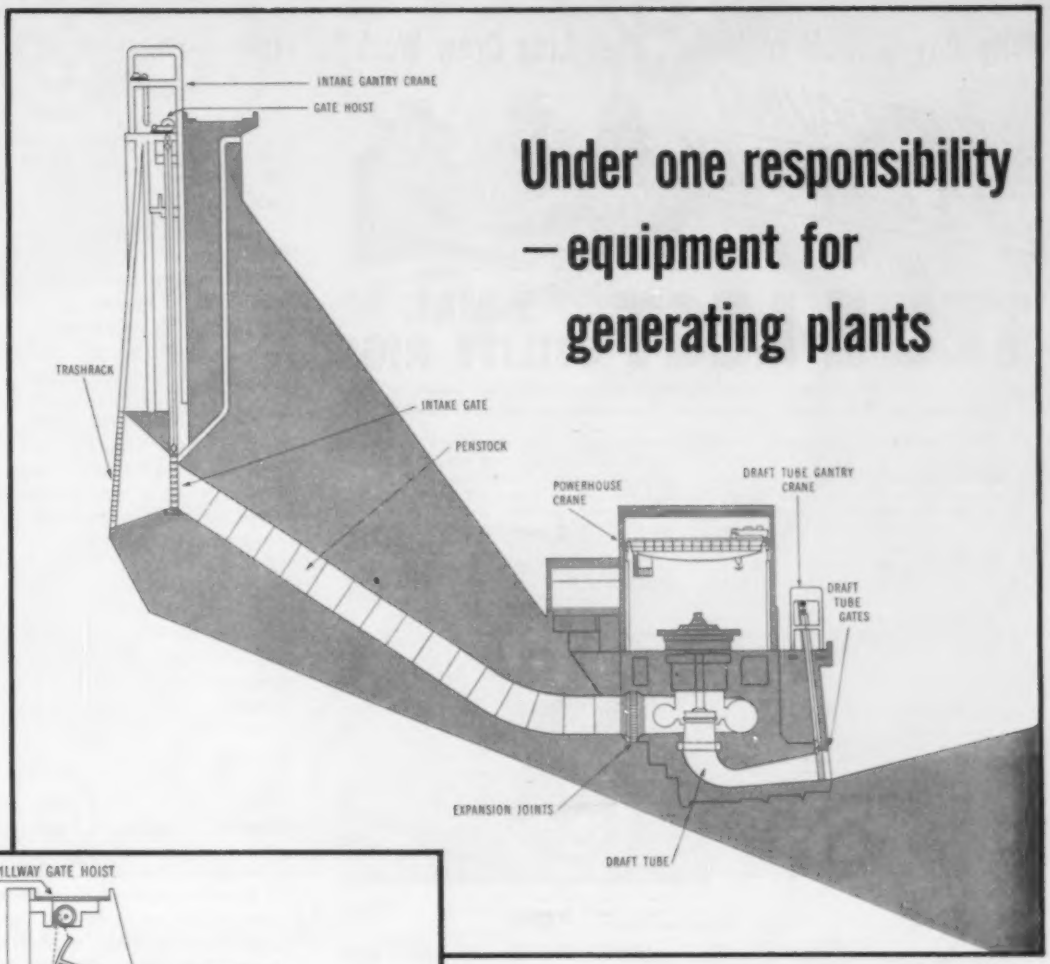
ThermoLab Corp, 11430 Hart St, North Hollywood, Calif., announces a non-plastic film-type **heating element** with operation temperatures to 500 F and in watt densities to 40 w per sq in. It is said to have excellent resistance to abrasion and corrosion.

Hobart Brothers Co, Hobart Square, Troy, Ohio, offers an ac-type **welder** in 300, 400, and 500-amp sizes. Designed for heavy duty production welding, it has a transformer of the shell type design, using "saturable leakage path control" for adjustment of welding current.

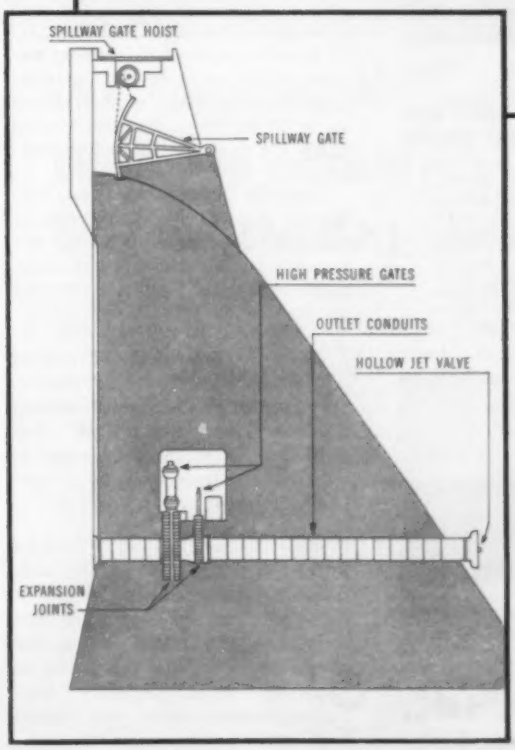
Toledo, Ohio, has a heavy-duty, six-roller **pipe cutter** designed to prevent spiraling when used with power drives. It threads ⅛ to 2-in. pipe.

Kohler Co, Kohler, Wis., is producing a 15-kw gasoline-powered ac **electric plant** in six models. Remote-control or stand-by starting, varying voltage out-

(*Continued on page* 246)



Under one responsibility —equipment for generating plants



● Under *one* responsibility, Paceco engineers, machines and fabricates many essentials for hydroelectric and steam power plants and waterworks.

You get from *one* source a cost-conscious engineering service and follow-through that eliminates divided responsibility.

Paceco service is available nationwide, at competitive prices, delivered and installed. We invite your inquiries.

PACECO
"TAILORS OF STEEL"

Pacific Coast Engineering Company

ENGINEERS • MACHINISTS • FABRICATORS

Alameda, Calif. • Phone LAkehurst 2-6100

Why Pay 3 MEN to Watch Your Line Crew Work?

START SAVING TIME and MONEY with

TEL-E-LECT 2-MAN UTILITY RIGS

If you're using 5-man crews and old fashioned utility equipment (even on '55 chassis) you've got *three extra men on most jobs!*

With Tel-E-Lect equipped trucks you'll discover the great time and money saving advantages of 2-man construction trucks. Leading public utility companies throughout the country are now using 2-man trucks to do a large share of the work once performed by 5-man crews—and they're realizing increased profits in the process.

Your 2-man crew won't work any harder, but they'll produce more and do it faster than many 5-man crews. You see, Tel-E-Lect builds the services of three men into its utility truck equipment. Tel-E-Lect equipment provides new power features that require only two men to perform the tasks once done by five!

The 2-man construction equipment described here lets you put smaller crews on everyday jobs while freeing big crews and big equipment for the really tough highline jobs.

THE TEL-E-LECT COMBINATION BODY

This *complete* package consists of a rugged steel body, stowaway derrick, winch and drive, pole hole digger and drive and rapid forward-reverse transmission. Three simple installation steps by your local mechanic puts the Combination Body on your truck chassis regardless of make or model. You simply install power take-off . . . mount body and connect power drive . . . and install cab controls. It's now ready to go to work!

A Tel-E-Lect all steel Combination Body is completely equipped with Stowaway derrick, digger and power units—a model 2-man construction truck.

Front mounted Tel-E-Lect "T" frame derrick and Tel-E-Lect Pole Hole Digger gives this utility truck 2-man versatility.

WINCH, DIGGER AND DRIVE KITS FOR ALL POPULAR-MAKE TRUCKS

A series of easily installed Tel-E-Lect kits make it possible to install derricks, diggers and power drives at the front of your present utility truck. The flexibility and economy of 2-man operation can be extended to any size or model of International 4x4, Ford, Chevrolet, GMC, Dodge or other truck.

"These Tel-E-Lect kits are designed specifically for the particular truck on which they will be installed. Each kit contains every part needed for easy installation by your local mechanic.

TEL-E-LECT SELF-STORING DERRICK CONVERSION KITS

An entirely new concept of derrick storage eliminates the hazards once involved in derrick erection and take-down. Your front mounted "A" or "T" frame derrick stores on top of the truck—doesn't use valuable body space for storage.

Your truck's winch supplies power to raise or lower derrick. With a double drum winch you'll get "live-boom" flexibility and with a single drum winch you'll get easily adjustable derrick elevation! This low cost unit fits any truck with or without body and is quickly installed.

This 2-man construction truck features a front mounted Tel-E-Lect T-45 derrick and Tel-E-Lect Self Storing Derrick Conversion. The derrick is shown in its stored position in the smaller photo.

Tel-E-Lect provides other kits for individual requirements. Write us about any of your utility truck problems.

TELE-LECT PRODUCTS, INC.

TEL-E-LECT PRODUCTS, INC.

10,003 Minnetonka Blvd., Minneapolis 16, Minnesota

New Equipment

(*Continued from page* 244)

puts, adjustable jet carburetor with automatic choke, and a mechanical pump with oil bath air filter are featured.

Heinemann Electric Co, 440 Plum St, Trenton 2, N. J., offers a 100-amp **circuit breaker safety switch** in an enclosure requiring only half the space of comparably rated fused switches. It is designed for 120/240 v ac, in two or three-wire installations.

Miracle Adhesives Corp, 214 E. 53rd St, New York 22, N. Y., has a polyvinyl chloride acetate **pipe covering** finish which "zips on and locks in place" to insure a watertight, airtight longitudinal joint.

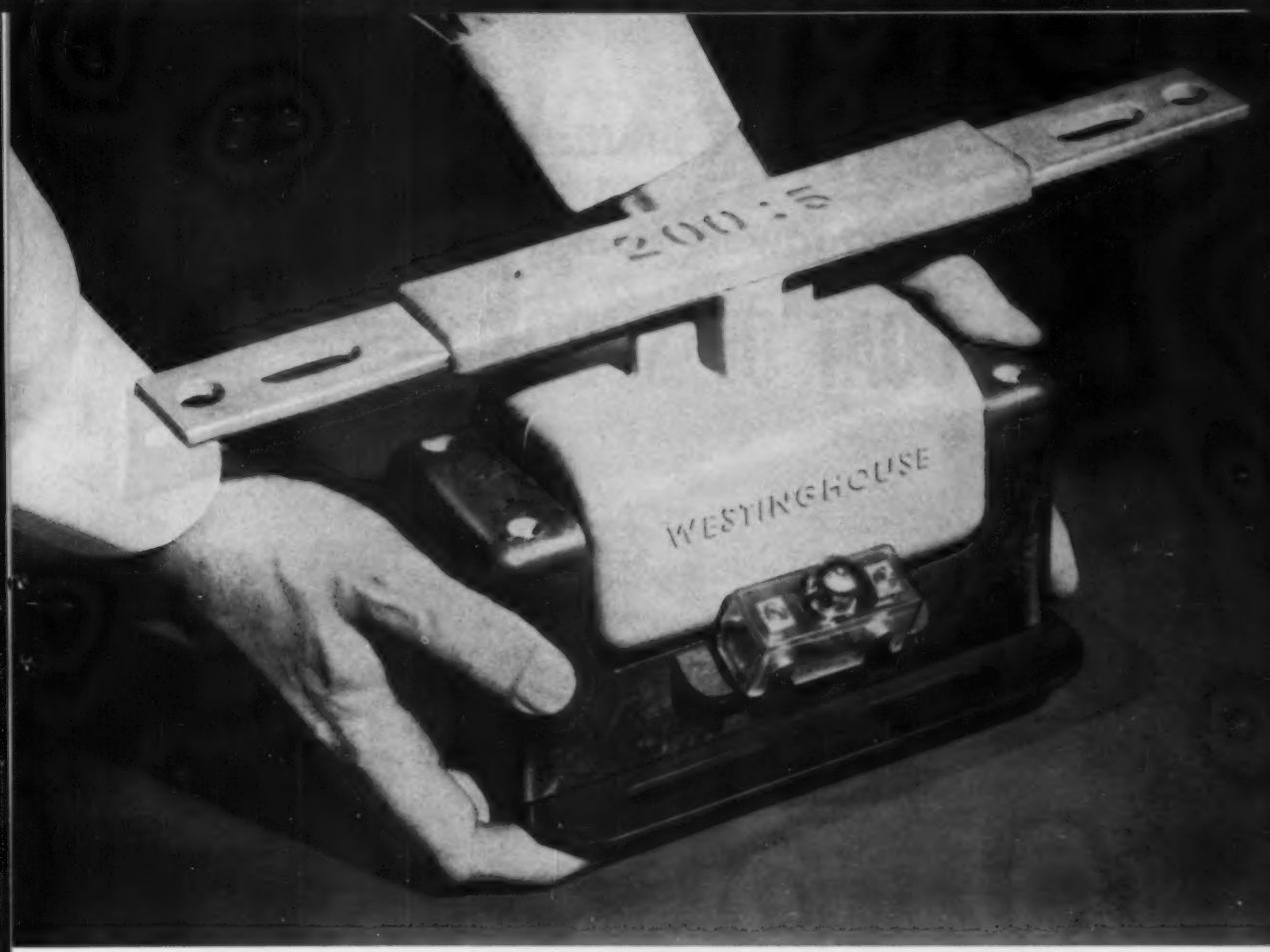
Porter-Cable Machine Co, 52 Exchange St, Syracuse 8, N. Y., has a **portable electric drill** (Model 137, 0.25-in.) that quickly penetrates wood, steel, plastics, composition board, and concrete. Using abrasive disks, this 2.75-lb drill sands wood and metal, and removes paint and varnish. A special bracket and grinding wheel convert the drill into an electric bench grinder.

Markem Machine Co, Keene 47, N. H. offers Model 65A **marking machine** which prints in one operation complete label detail on flat objects up to 30 in. long. Multiple printing heads are available for color work.

Panalarm Div of Panellit, Inc, 7401 Hamlin Ave, Skokie, Ill. reveals its audio-visual **annunciator** using one plug-in relay unit for each three-light, high-low station. Ask for Bulletin HL-30.

Daven Co, Dept. RC, 191 Central Ave, Newark 4, N. J. has thermocouple **transfer switches** with contact resistance less than 0.004 ohm. Switches use silver alloy contacts, slip rings and rotor arms; no thermal EMF is present.

Frontier Bronze Corp, 4851 Packard Rd, Niagara Falls, N. Y. has **nonsparking pipe wrenches.** Made of aluminum alloy, the wrenches take beryllium-copper insert jaws instead of steel to make them safe to use in hazardous areas, company says. Largest wrench, 36-in. size, weighs 9 lb 9 oz.



TYPE SM-5 CURRENT TRANSFORMER (indoor service)

Molded in silicone— lightest, smallest, most durable 5-kv unit built!

The Westinghouse Type SM-5 current transformer is silicone insulated throughout—has a rating factor of 1.5 and has 0.3 accuracy class for all metering burdens—meets all ASA and NEMA Standards—yet is smaller, lighter and more durable than any 5-kv unit built to date.

The exclusive new silicone-base insulating material is permanently molded to the core-coil assembly—is impervious to atmospheric condition—has high dielectric strength, low insulation power factor, high resistance to electric creepage, abrasion or rough handling. It does not age under temperature, sunlight or humid conditions.

Exclusive Hipersil® Type C cores, complete mounting flexibility, an automatic or manually operated short-circuiting device, silver-plated primary terminals and other equally outstanding design features make the SM-5 the leader in its class.

Get full details now from your local Westinghouse representative or write direct for booklet B-6396 Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70735

YOU CAN BE SURE...IF IT'S

Westinghouse

Expect 5 to 8 YEARS protection

for galvanized towers from a

SINGLE COAT OF SUBOX

There's no better anti-corrosive pigment for painting over galvanizing than active suboxide of lead—the basic pigment in Subox and Subalox paints.

There's no surer way to get economical and effective preservation of galvanized structures than by coating them with Subox or Subalox. In most instances, a single coat is sufficient and Subox or Subalox—will not chip, crack or blister during years of exposure to the elements.

What's more, repainting is simpler and more economical when these paints are used. They cost no more than any good paints, and can be relied on to save you money for years.

Write for a free copy of "Corrosion Control of Electrical Structures and Equipment".

Subox Inc. 3 FAIRMOUNT PLANT HACKENSACK, N. J.

CATALOGS · BULLETINS

● **C-C REGULATORS:** Bulletin CCR-473 covers static-type constant-current regulators for series lighting circuit, presents advantages, specifications and lamp-capacity tables for selecting size of regulator. Hevi Duty Electric Co, Milwaukee 1, Wis.

● **TRANSFORMERS:** A guide to check installation, operation and maintenance of dry-type transformers with Class B insulation, is presented in Manual T-2. Hevi Duty Electric Co, Milwaukee 1, Wis.

● **COMBUSTION SAMPLING:** This leaflet discusses Combustion Sampling System A-2992 as a method of preparing for analysis samples of gas from steam plants, open hearth furnaces, and rotary kilns that are fired by oil or coal. Arnold O. Beckman, Inc, 1020 Mission St, South Pasadena, Calif.

● **COMBUSTIBLE GAS ANALYZERS:** This 22-page booklet is aimed at explaining the functions of analyzers, alarms and recorders, and at telling where and how to use them to protect men and property. Mine Safety Appliances Co, 201 North Braddock Ave, Pittsburgh 8, Pa.

● **MAGNET WIRE:** This is a pocket-sized edition of the larger Magnet Wire Catalog but carries the designation C-79-12A. Anaconda Wire & Cable Co, 25 Broadway, New York 4, N. Y.

● **SMALL MOTORS:** High-power, unidirectional Type YAF motors, available in nine power ratings from 1/200 to 1/40 hp, are described in catalog F 4271-5. The brochure also includes other types of unidirectional, synchronous, reversible, and geared-head shaded-pole motors with ratings up to 1/20 hp. Barber-Colman Co, Small Motors Division, 1200 Rock St, Rockford, Ill.

● **ARC LAMPS:** Zirconium concentrated-arc lamps for general or critical microscopy, photomicrography, microscope projection, and other special lighting needs are illustrated in a 4-page booklet. Burton Mfg Co, 11201 W. Pico Blvd, Los Angeles 64, Calif.

● **GRAPHIC INSTRUMENTS:** Recording ampere, watt, volt, kilovar, kilovolt-ampere, and tachometer meters are covered in a 16-page condensed Catalog 854. Mechanical and electrical data are included. Esterline-Angus Co, Inc, P. O. Box 596, Indianapolis 6, Ind.

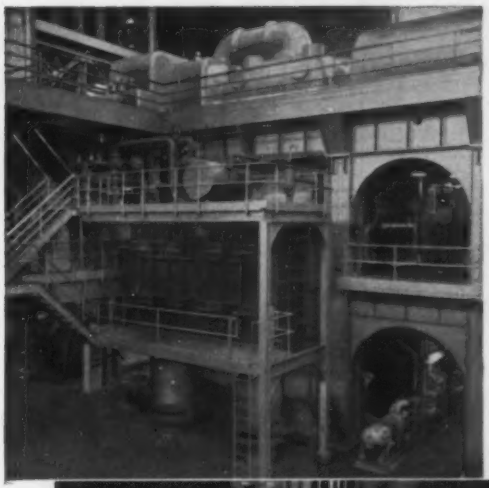
● **COOLING TOWER:** A 4-page Process Data Sheet 700(1) suggests methods of measuring and controlling the pH of cooling tower water, and describes specialized equipment for the task. Leeds & Northrup Co, 444 North 16th St, Philadelphia 30, Pa.

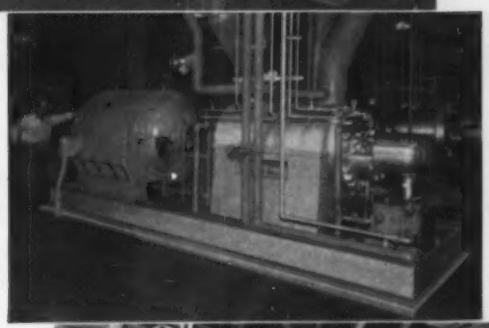
● **PRE-MIXED MORTAR:** A 9-page folder on pre-mixed grout and a 4-page folder on pre-mixed mortar describe the advantages of using these products in grouting machinery, anchor bolts, and building columns, and in patching floors, steps, wall seams, and cracks. Master Builders Co, 7016 Euclid Ave., Cleveland 3, Ohio.

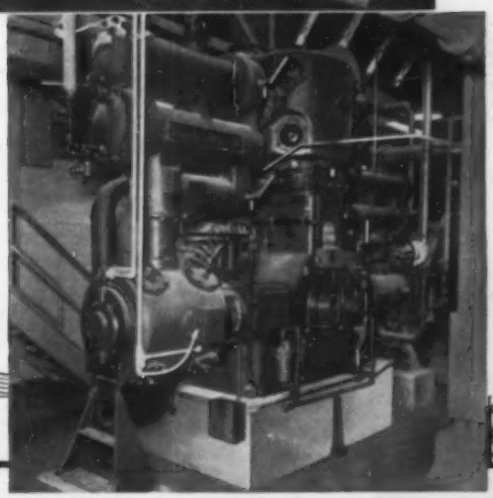
● **ELECTRIC HOISTS:** Cut-away photographs, charts, and diagrams help display a line of air-cooled wire rope electric hoists that can handle 0.25 ton to 15 tons. Ask for 16-page brochure P-495-A. Yale & Towne Mfg Co, 11,000 Roosevelt Blvd, Philadelphia 15, Pa.

● **POWER CAPACITORS:** A 12-page bulletin, PFC-104, describes capacitors in steel and stainless steel cases for primary and secondary power distribution circuits and industrial circuit applications. Tobe Deutschmann Corp, Norwood, Mass.

PROVED DEPENDABILITY
in Power Plant Equipment







Condensers: Surface types for every generating capacity in space-saving rectangular design. Also Disc-Flow and ejector jet barometric condensers and a complete line of I-R auxiliaries, including steam-jet ejectors, vacuum pumps, air leakage meters, circulating and condensate pumps.

•

Boiler Feed Pumps: For all pressures, capacities, and temperatures. Also single and multi-stage pumps for every power plant requirement in centrifugal, mixed and axial flow types.

•

Compressors: Stationary air compressors are available in all sizes and types, either direct connected or belt driven, for soot blowing, instrument air and other power plant services. A complete line of Gyro-Flo portable air compressors in sizes to 600 cfm provide a dependable source of air power for plant construction and maintenance.

•

Ingersoll-Rand's specialized experience in building dependable power plant equipment is at your service. A call or letter to your nearest Ingersoll-Rand office will bring a quick solution to your specific problems. There's no obligation, of course.

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

14-33

AIR AND ELECTRIC TOOLS • DIESEL ENGINES • PUMPS • CONDENSERS • COMPRESSORS • VACUUM EQUIPMENT

Here's the new
TM-16
KILOWATT HOUR
TELEMETERING SYSTEM
ACCURATE FAST FLEXIBLE
A new approach to KWH telemetering
Substation
It's new...
It's better...
It's by
Control
Corporation
TM-16 provides an accurate counting unit for impulses from your KWH meter and gives you the accumulated total upon call. The impluse storage unit does not cancel when a reading is transmitted. One or more storage units can be used with a common transmitter scanner, and a common receiver, to provide low cost multiple readings. Fast transmission gives you a count of 999,999 in only six seconds.
Can be used over any type of channel, and is especially desirable over single frequency carrier and other non-continuous types of channel. Can share channel with other services as TM-16 requires only a few seconds per reading.
The easily read indicator gives fast, error proof readings. Can be used with automatic printer for permanent records. If you want better KWH telemetering write for more information.
CONTROL CORPORATION
723 CENTRAL AVE. N. E. • MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •
TM-16 storage unit provides accurate count of KWH impluses.
Receiver gives easily read, error proof readings.

TECHNICAL LITERATURE

USDC—The following publications are available from the U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.: • "Electrostatic Dissipation by Electrically Conductive Rubber." PB-111,414. Price $1. • "Electrical Properties of Phthalocyanine." PB 111,419. Price $2.

COMMUNICATIONS—Motorola Communications & Electronics, Inc, Technical Information Center, 4501 West Augusta Blvd, Chicago 51, Ill, has these publications available: • Technical Bulletin E-109, "Supervisory Control Equipment," gives answers to problems of remotely operating circuit breakers, valves, pumps, generators and motors. • Technical Bulletin E-111, "Power Line Carrier Equipment," tells how telemetering, protective relaying, and load control supervisory signals can be transmitted simultaneously with voice over the same power line carrier channel. • Technical Bulletin E-112, "Frequency-Shift Voice Frequency Carrier," describes multiplexing as particularly adapted to remotely controlled installations, centralized dispatching, and industrial automation.

CIRCUIT BREAKERS—"Rules for the Unit Testing of Circuit-Breakers for Making-Capacity and Breaking-Capacity," 15 pages. This ASTA Publication No. 15 covers an alternative to testing circuit breakers on a full-scale basis. Association of Short-Circuit Testing Authorities, Inc, 36 Kingsway, London, W.C.2, Eng. Ten shillings.

RECTIFIER DESIGN—A 128-page illustrated handbook on selenium and copper oxide rectifiers has been prepared to help design and development engineers. It deals with rectifier types, designs, circuitry, characteristics, and applications. Price: $2.00 per copy. Bradley Laboratories, Inc, New Haven, Conn.

STEAM-LINE CLEANING—Blowing Out Main Turbine Steam Lines Before Initial Operation is a 32-page report of the Turbines and Condensers Subcommittee of EEI's Prime Movers Committee. It digests the practice of 41 companies that recently cleaned 17 nonreheat and 24 reheat units. Publication No. 54-17 is 40¢ to members and their employees, $1.00 to non-members in the U.S., and $1.10 to foreign countries. Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y.

PLASTIC RESIN—A 60-page booklet describing Teflon is devoted largely to discussing the uses, properties, molding, ram extrusion, and calendering of this tetrafluoroethylene resin. E. I. Du Pont de Nemours & Co, Inc, Wilmington 98, Del.

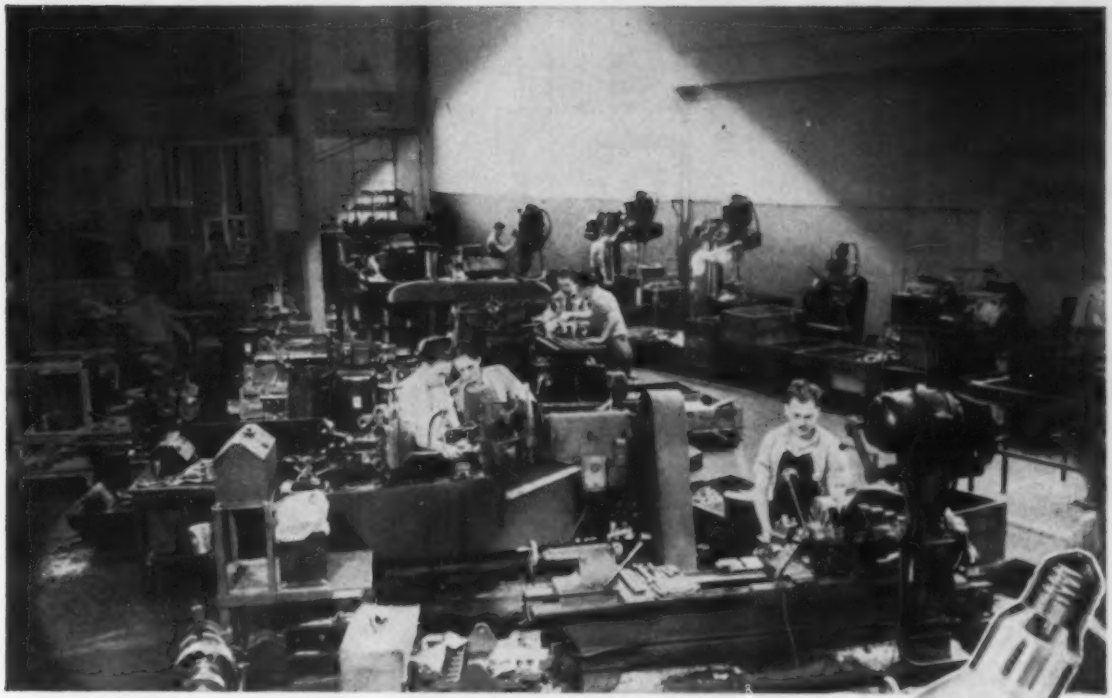
FILM CATALOG—A 36-page catalog (B-6505) of sound motion pictures and slide films covers a variety of subjects. Films are classified into three groups: general interest, product information, and training films and instruction courses. Film order forms are included. Westinghouse Electric Corp, P.O. Box 2099, Pittsburgh 30, Pa.

LINE MAINTENANCE—A 162-page descriptive manual on high voltage line maintenance contains sections on care of hot-line tools, training hot-stick crews, operation of principal hot-line tools, and 21 basic hot-line tool jobs with step-by-step procedures. Copies of "Hot Sticks" may be had for $2.50 each. A. B. Chance Co, Advertising Dept, Centralia, Mo.

DISTRIBUTION—"Installing, Jointing and Terminating 15 kv Polyethylene Insulated Power Cable" is the subject of Kabelitems No. 75. Bakelite Co, 30 East 42nd St, New York 17, N. Y.

NOW...

this much "golden white" light from a single 400-watt mercury-vapor lamp



SYLVANIA J-H1 mercury-vapor lamp

HERE'S THE LAMP that opens new vistas in lighting . . . SYLVANIA's new, color-improved mercury-vapor lamp, type J-H1.

With this new lamp, you get more "golden white" light . . . without the color distortions you expect from a clear mercury lamp . . . 18,000 lumens of "golden white" light . . . in a lamp that lasts over two years in normal industrial use. That's more than twice the output of an incandescent lamp of equivalent wattage.

Relight with Sylvania J-H1 color-improved mercury-vapor lamps from your Sylvania supplier today.

FOR THE FULL STORY
on Sylvania mercury-vapor lamps, write for the free booklet "More Light for Less Money."

Dept. 5L-2802
SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING · RADIO · ELECTRONICS
TELEVISION · ATOMIC ENERGY

Keep your eye on SYLVANIA
...fastest growing name in sight

For that EXTRA SAFETY FACTOR
in OVERHEAD GROUND WIRES
Crapo
Weldless
Galvanized
STEEL STRAND
MAXIMUM STRENGTH and dependability in overhead ground or static wire is assured when you specify Crapo Weldless Galvanized Steel Strand, specially designed and manufactured to shield transmission lines against lightning.
CONTINUOUS LENGTHS of this 7-wire strand are produced without welds or joints of any kind in either the individual wires or finished strand. High fatigue endurance provides that extra factor of safety so important in overhead ground wire. Laboratory-controlled manufacturing constantly insures high, uniform quality to make it your most practical and economical strand for this purpose.
Crapo GALVANIZING applies a dense, uniform and ductile zinc coating, tightly bonded to the wires for lasting protection against corrosion. Crapo Weldless Galvanized Steel Strand is available with Class A, B or C coatings in approved sizes and grades.
Ask your Crapo representative for Booklet OG-25 containing Sags and Tension data . . . or write direct!
INDIANA Steel & Wire Co., Inc.
MUNCIE, INDIANA

BOOKS

Received Since Dec. 7

Magnetic Control of Industrial Motors. By Gerhart W. Heumann. Published by John Wiley & Sons, Inc. New York 16, N. Y. 714 pages, illustrated. Price $9.50.

Radiant Heating. By Richard W. Shoemaker. Published by McGraw-Hill Book Co, New York 36, N. Y. 346 pages, illustrated. Price $7.00.

Prestressed Concrete, 3rd Edition. By Gustave Magnel. Published by McGraw-Hill Book Co, New York 36, N. Y. 345 pages, illustrated. Price $8.00.

Glass Reinforced Plastics. Edited by Phillip Morgan. Published by Philosophical Library, New York 16, N. Y. 248 pages, illustrated. Price $10.00.

Raw Material for Electric Cables. By A. King and V. H.. Wentworth. Published by Ernest Benn Ltd. Distributed through John de Graff, Inc. New York 10, N. Y. 362 pages, illustrated. Price $7.00.

Power Plant Design

Electric Power Stations—4th Edition. By T. H. Carr. Published by Chapman and Hall, Ltd, London, 605 pages, illustrated. Price 70 shillings.

Volume one of a two volume treatment of British practices in steam station design covers design fundamentals, foundations, circulating water systems, cooling towers, coal and ash handling, boiler plants, piping and turbines. The book gives extensive treatment, well supplemented with illustrations, tables, and diagrams.

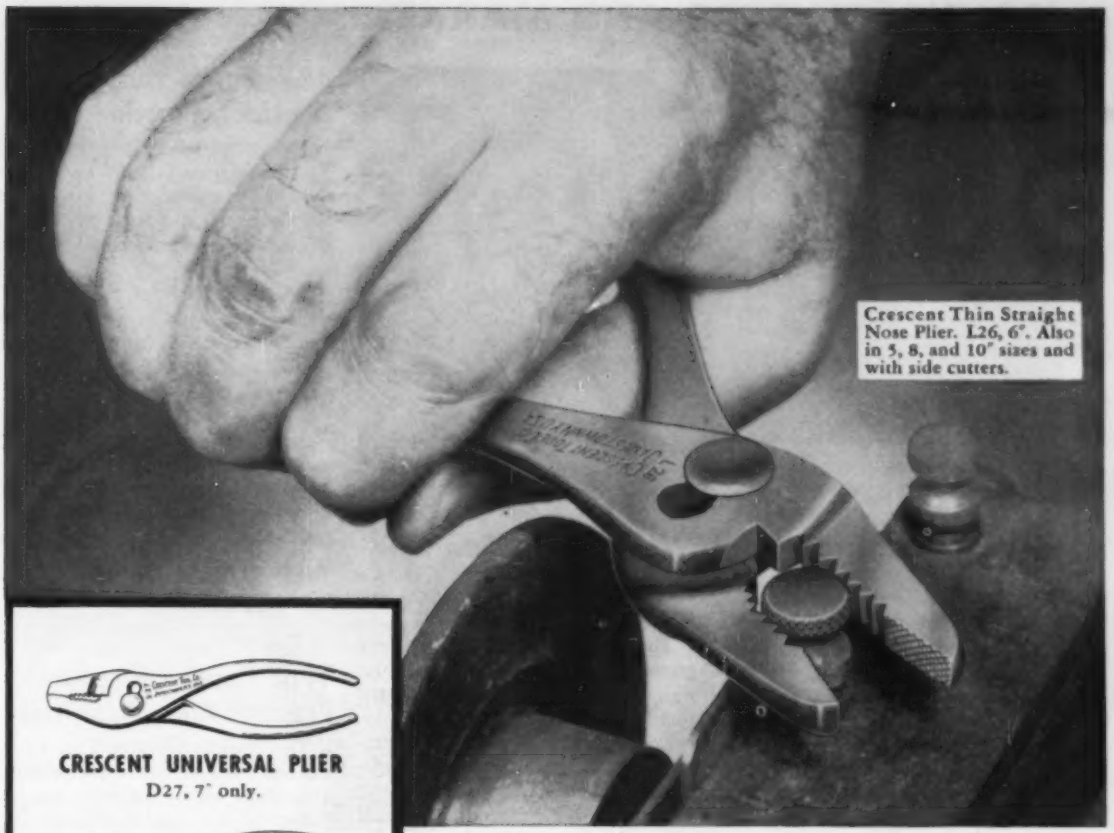
The chapter on station design discusses principles involved in selecting the plant cycle arrangement, steam pressure, steam temperature, and generation voltage. Choice of site and station arrangement are also discussed. Outdoor stations are mentioned only briefly, reflecting the fact that they are not used in Britain. Different types of circulating water supplies and their economies are considered in another chapter. Cooling towers, both induced and forced, are included. The forced circulation boilers used in Europe are also treated.

Practically all illustrations and bibliography items are based on British and European practice and literature. But where British practices resemble American the book can prove valuable to American power plant designers.

An Aid to Wiring Design

Voltage Drop Curves. Published by Marco Liberty, 126 Liberty St., New York 6, N. Y. 32 pages including 30 charts. Price $2.00.

Today's mounting interest in adequate wiring focusses new attention to voltage drop in building wiring as well as in its current capability. Curves contribute much to speeding the myriad calculations otherwise required. Here, the author presents curves for practical voltage drops in the wires sizes commonly used for voltages from 115 1-ph to 2,300 3-ph.



Crescent Thin Straight Nose Plier. L26, 6". Also in 5, 8, and 10" sizes and with side cutters.

CRESCENT UNIVERSAL PLIER
D27, 7" only.

MoToR KiT COMBINATION PLIER
G25, 5". Also in 6, 8, and 10" sizes.

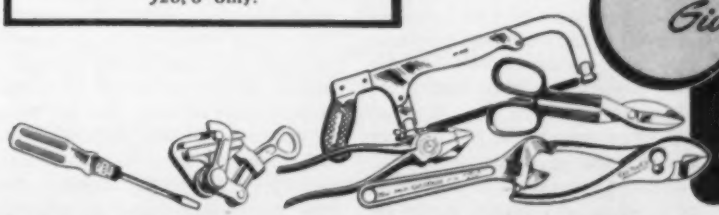
CeeTeeCo COMBINATION PLIER
H25, 5". Also in 6, 8, and 10" sizes.

CRESCENT THIN BENT NOSE PLIER
J26, 6" only.

CRESCENT
SLIP JOINT PLIERS

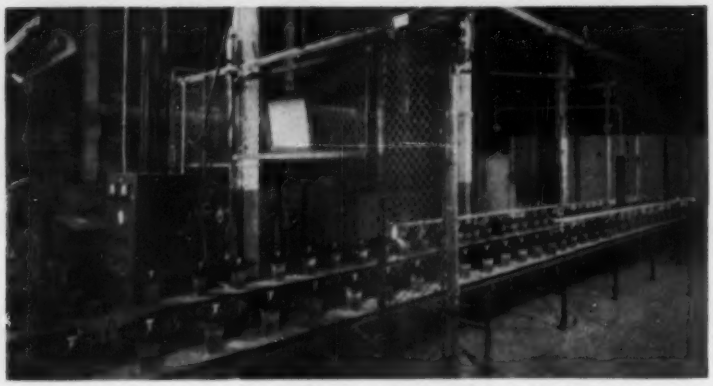
Crescent offers a wide selection of styles and sizes in this widely used plier type. All are drop-forged from special analysis steel and finished in bright plate. They have sharply milled teeth, comfortable handles and smooth working joints. The joint bolt and nut are turned from solid bar steel and case hardened. Sold by Industrial Distributors and Hardware Dealers everywhere.

CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by
CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

MANUFACTURERS AND MARKETS



CONTINUOUS FLASHOVER TESTING is now routine operation with this new test rack, 60-cycle 225-kv cascaded transformers, regulator and resistor bank

Victor Insulators Has 225-kv Tester

Victor Insulators Division, I-T-E Circuit Breaker Co, Victor, N. Y., has completed installation of a 60-cycle, 225-kv continuous flashover tester, D. E. Alexander, chief engineer, has stated.

This equipment was built to provide maximum effectiveness in conducting routine flashover tests. The operator is able to get regulated 60-cycle flashover to a definite time standard; and by a vertical positioning of electrodes and selection of proper voltage and current, he is able to obtain the proper flashover power conditions.

The equipment consists of a grounded metal plate conveyor; three high-impedance, specially wound test transformers cascaded to give 225-kv, rms, to ground; control and instrument panel; remote controlled regulator; resistor bank in the 440-v feed; line electrode and grounded enclosure with safety circuit breakers on the gates for operator protection. (Enclosure was not completed at the front when photograph was taken.)

Bids May Open April 15 For Table Rock Dam Units

Invitations may be issued by February 15 with bidding dates through April 15 for four electrical items in the powerhouse at Table Rock Dam. This announcement was made by Col. Staunton Brown, Little Rock District Engineer, Corps of Engineers, P. O. Box 867, Little Rock, Arkansas.

Equipment includes two 50,000-kw main generators with turbines; one main 3-phase, 13.8-161-kv transformer; two "house units" each consisting of a 1000-hp turbine with governor and 750-kw generator.

Electrical equipment is scheduled for delivery in 1957 and 1958 for installation by the powerhouse contractor, except the two main generators which are to be installed by the manufacturer. The powerhouse will be erected under a contract tentatively set to be awarded in late 1956.

Color TV in Industry

CBS-Columbia has entered the industrial television field with an industrial color camera chain. This closed circuit color chain will be manufactured in the Long Island City, N. Y., plant. It is part of CBS-Columbia's program of expansion and diversification in the electronics field. The company reports high color fidelity, ease of operation and low cost. The lightweight camera can be remotely controlled, switches lenses automatically and can be connected to any number of monitors. An integral power generating unit is part of the chain.

B&W Forms New Contract, Erection Dept

Babcock & Wilcox Co has formed a new department, Contract and Erection, which consolidates the contract and erection phases of the Boiler Division's operations, according to an announcement by M. Nielsen, vice president in charge of the Boiler Division. The department will be located in a new building near the company's largest manufacturing plant at Barberton, Ohio.

Lawrence W. Hayward has been named manager of the new department. Reporting to Hayward are: R. W. Fox, contract manager, and J. P. Craven, erection superintendent; both will continue to be in charge of these respective functions.

Tape Council Brochure Presents Aims, Activities

The Pressure Sensitive Tape Council, organized in 1953, has prepared a brochure giving the aims and objectives of the trade association. Primary activities are listed as: Standardization in nomenclature and test methods; matters of traffic and transportation; use of packaging; and educating the consuming public.

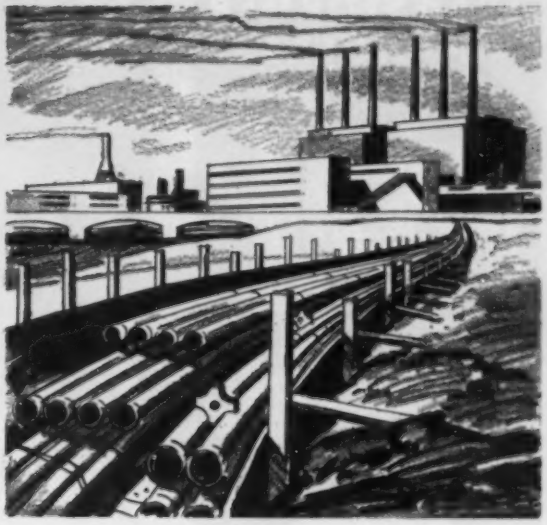
Membership is a list of manufacturers who are producing and marketing pressure sensitive cloth and paper tapes. The council is not concerned with medical, cellophane, acetate fiber or plastic film tapes.

R. G. Breeden is secretary-manager of the council, addressed at 530 Echo Lane, Glenview, Ill.

Motorola Supplies Carrier

Motorola Inc, has received an order from Minnkota Power Cooperative, Inc, Grand Forks, N. D., to expand its supervisory control and power-line carrier system to include two additional remote stations. This will bring to 16 the supervisory stations on the 1,200-mile, 69-kv transmission line. The expansion will accommodate two new interchange tie points receiving power from Garrison Dam.

LIFE LINES



Oxygen lines are the life lines of every diver!

Electric cables are the life lines of every community!

Orangeburg Fibre Conduit gives cables complete underground protection!

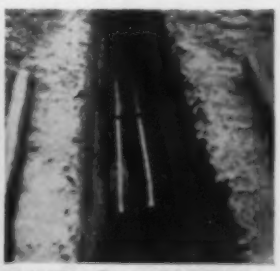
ELECTRICAL CABLES...the *life lines* through which power flows into every community's homes, offices and plants...must have the fullest and the longest protection possible. And that is what they get in the underground ducts with Orangeburg Fibre Conduit.

This is a fact so well understood throughout the electrical industry that Orangeburg Fibre Conduit is a first choice of Public Utilities, Municipalities, Industries and Electrical Contractors everywhere.

The reasons for Orangeburg's High Quality! Tough, strong, resilient, non-metallic...Orangeburg Fibre Conduit does not crack or break. Its impermeable walls and tight joints bar out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion while *going in* and *after they are in* the duct. Orangeburg material resists acids, alkalies, salt, grease, oil. The net result: a *longer-lived* raceway for *longer* cable life.

Check these cost-saving advantages...Light weight ... long lengths ... readily assembled joints ... angle couplings, bends and other Orangeburg standard fittings ... these are some of the reasons why Orangeburg Fibre Conduit is so quick, easy and economical to install. Send to Dept. EW-15 for more facts.

ORANGEBURG MANUFACTURING CO., INC.
ORANGEBURG, NEW YORK
West Coast Plant, Newark, Calif.



ORANGEBURG FIBRE CONDUIT

STANDARD with concrete encasement **NOCRETE** without concrete encasement

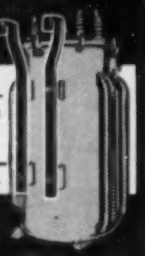
---

Graybar ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT
BRANCHES AND STOCKS IN PRINCIPAL CITIES

GENERAL ELECTRIC SUPPLY COMPANY
A Division of General Electric Distributing Corporation

THIEL
TRANSFORMER HANGERS



MODEL	C-1	C-3
TRANSFORMER	75-100 KVA Single-Phase	75-112½ KVA Three-Phase
WEIGHT	46 lbs.	100 lbs.

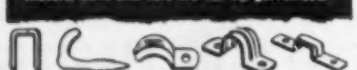
Thiel Hangers, made according to NEMA specifications, are hot-dip galvanized to insure dependable service. In two styles, complete with galvanized bolts and nuts.

MODEL	1-PHASE	3-PHASE	WEIGHT
T-1	3-15 KVA	9 KVA	16¼ lbs.
T-2	25—37—50 KVA	15-45 KVA	37¼ lbs.

Hangers and Kickers *in Stock!*

HANGER KICKERS

MODEL K-1, which can be mounted in four different positions, is designed for use with T-1 Hanger shown above. MODEL K-2, for use with T-2 Hanger, has five mounting positions. Kickers, bolts and nuts are hot-dip galvanized.



Electrical Fasteners That Hold . . .

THIEL TOOL AND ENGINEERING CO.

1417 No. Market St. • St. Louis 6, Mo.

PUNCHED CARDS are duplicated by IBM transceiver in New York, at opening of General Electric's four-point data transmission circuit. Glenn B. Warren, center, vice president, GE Turbine Division, receives the cards from Mrs. Betty Horn. Looking on are Thomas J. Watson, Jr., left, IBM president, and Allen Keller, supervisor of turbine development engineering.

GE Will Use Two "Brains"

A four-way hookup for the rapid processing of engineering and research problems on two electronic "brains" has been put into operation recently by General Electric Co. The "brains" are No. 701 computers made by International Business Machines Corp.

GE plants in Evendale (near Cincinnati), Ohio, in Lynn, Mass., and in Schenectady, N. Y., are linked. Fourth point in the hookup is IBM's technical computing bureau in New York City. At this latter location is one "brain" which is rented to GE. Other "brain" is located at GE's computing center of the aircraft gas turbine division in Evendale.

The link between the computing centers is IBM's electronic data transceiver. This device duplicates sets of punched cards at remote points by telephone, telegraph or radio circuit. Cards are reproduced from point to point at the rate of eleven fully punched cards per minute. The analytical section of some jobs can be completed in 24 hr, compared to three or four weeks by hand methods.

The transceiver hookup augments GE's telegraphic network used to deliver its problems and answers from turbine departments at Schenectady and Lynn to the computing facility in Evendale. When GE receives additional IBM electronic data processing machines in 1955, the IBM station in New York will be discontinued.

MANUFACTURING BRIEFS

Westinghouse Electric Corp has paid $2-million to employees for good ideas. Latest award was $1,300 to William Wrobleski, East Springfield, Mass., appliance plant worker, for suggesting how to make a better electric fan. Wrobleski suggested a convex metal safety screen for the front and back of the company's Mobilaire fan. Pres. Gwilym A. Price made the presentation . . . Company fired recently four men and one woman from the employment rolls of its East Pittsburgh plant as "undesirable employees." Westinghouse reported "all five have been accused in sworn testimony before appropriate government authorities of Communist Party activities . . ." Two of the released men were affiliated with UEW.

Union Carbide & Carbon Co has a new area office building and distributing center at 1300 Lakeside Avenue, Cleveland, Ohio. It is being financed by Metropolitan Life Insurance Co and leased to Union Carbide on a long-term basis. The new headquarters houses these Division of Union Carbide: Bakelite Co, Carbide and Carbon Chemicals Co, Electro Metal-

naturally . . . Mica is the ideal insulation . . . and skillfully treated, shaped and molded, it becomes

MACALLEN MICA

. . . retaining all its indispensable dielectric properties, while adding workability, uniformity, standard thickness and size, and absolute reliability, for efficient, economical electrical and industrial applications. MACALLEN means Mica — PLUS!

THE MACALLEN COMPANY

BAY ROAD, NEWMARKET, NEW HAMPSHIRE

when you think of MICA . . think of MACALLEN

MACALLEN MICA

ALL FORMS • ALL QUANTITIES • ALL DEPENDABLE

CHICAGO: 565 W. WASHINGTON BOULEVARD • CLEVELAND: 1231 SUPERIOR AVENUE

Another Job Done Better With The ALL-NEW 'Jeep'®

"GO-ANYWHERE" TRANSPORTATION

Here's the vehicle that takes men and tools to the job when nothing else can—the all-new 4-Wheel-Drive 'Jeep'. With the extra traction of its 4-wheel-drive, the 'Jeep' goes through mud, sand, snow and roadless country . . . saves time when time counts most. It is good business to own the all-new 'Jeep' . . . and good insurance of getting through to the job every day in the year. Get all the facts about the all-new 'Jeep'.

WILLYS MOTORS, INC.
TOLEDO 1, OHIO

'JEEP' • 4-WHEEL-DRIVE TRUCK • 4-WHEEL-DRIVE STATION WAGON • 4-WHEEL-DRIVE PANEL DELIVERY

THE WORLD'S MOST USEFUL VEHICLES

lurgical Co, Haynes Stellite Co, Linde Air Products Co, and National Carbon Co. Osborn Engineering Co were architects and engineers. Gilmore-Olsen Co erected the building.

J. F. Pritchard & Co, engineers, constructors and manufacturers, is in its new general office at 4,625 Roanoke Parkway, Kansas City, Mo. Floor space is approx 46,000 sq ft. Adjacent off-the-street parking areas are provided. More than 300 people are employed in this home office. Total employment ranges from 1,000 to 1,500 depending on the construction work currently in progress.

General Electric Co and Telechron have combined their electric clock operations and integrated design, distribution, and merchandising of their lines, effective Jan. 3, 1955. A. F. Fisher is general manager of the new Clock and Timer Department which will have headquarters at Ashland, Mass. The combined lines will be supported by extensive advertising and sales promotion in 1955.

Carrier Corp, manufacturer of air-conditioning devices at Syracuse, N. Y., and Affiliated Gas Equipment Co, producer of Bryant home furnaces, have agreed to merge through an exchange of stock, subject to shareholders approval . . . **U. S. Hoffman Machinery Corp,** New York 36, N. Y. has acquired sales representation for all Hygrade Atlas Inc. products. Included in the new line are metal-cleaning, rust-proofing, and paint-bonding equipment, as well as drying ovens, electrostatic painting equipment, paint spray booths, and ovens.

Wagoner Corp, Nashville, Tenn, manufacturer of electric and gas water heaters, is constructing a 40,000 sq ft plant on a 4-acre site in that city's 200-acre suburban-industrial development; production capacity is expected to be 300 water heaters per 8-hr shift . . . **Corning Glass Works** will break ground for a new research and administration center (approxmiately 250,000 sq ft of floor area) in Corning, N. Y. . . . **Bristol Co,** Waterbury, Conn., has added offices for application engineering department on automatic controlling, recording, and telemetering instruments; also has expanded heat treating facilities for instrument parts and set screws.

SALES ASSIGNMENTS

COMPANY STAFFS

Line Material Co, Milwaukee, has appointed John L. Barger field engineer in its East Central Division to replace Dale Swanson, Jr, who has been transferred to the company's West Coast Division. Barger has his office in Grand Rapids, Mich., from which he will assist S. Max Pearsall in handling L-M sales in western and northern Michigan. Swanson is now working out of L-M's Los Angeles office, representing the firm in southern California.

General Cable Corp, New York, has announced these appointments: Joseph S. Pitts has been promoted to Midwest district manager with headquarters at St. Louis, and Thomas B. Jones has been named Southeastern district manager at Atlanta. New branch managers include: John E. Moore at Los Angeles replacing Jones; Earl H. Lucas, Jr, at Tampa; Donald H. Phelps, New Haven; Charles M. Sherwood, New York; Albert L. Rountree, at Newark succeeding Sherwood; Harold V. Wrasse, Baltimore; and Russell E. Kirk, Lincoln, Neb.

Burndy Engineering Co, Inc, Norwalk, Conn. has announced that L. S. Berkley, manager, New York sales, will have supervision of that office at its new location at 20 East 1st St., Mount Vernon, N. Y. Burndy said the relocation will help that office to serve better the sales district's territory in New York City, Long Island, northern New Jersey, and up through the Glens Falls section of New York State.

Sylvania Electric Products, Inc, has made these assignments for its Lighting Division: Frederick H. Heintz was appointed Midwest regional sales manager of lighting products. Heintz, who has been sales manager of the Chicago district since 1951, will make his office at 2001 N. Cornell Ave., Melrose Park, Ill. Samuel H. Eaton was made special sales representative for the Midwest region. Eaton, who will be headquartered at the Melrose Park office, will be assigned to the division's national accounts group. He formerly was assistant district manager of Sylvania's Chicago district.

Pittsburgh Reflector Co has added Ralph M. Davis to its Pittsburgh sales staff to handle sales in that area for the entire line of Pittsburgh Permaflector incandescent and fluorescent lighting equipment. Davis formerly held sales positions with Sylvania Electric Products, Inc, and Westinghouse Electric Corp.

REPRESENTATIVES

Preformed Line Products Co, Cleveland, has announced the appointment of two new sales representatives: F. C. Clatterbaugh of Omaha, Neb., and H. Jack Belcher & Associates of Jacksonville, Fla. In addition, the whole state of Virginia has been added to the territory of the Electrical Distributors Co of Philadelphia.

Thomas & Betts Co, Elizabeth, N. J., has revealed that its Detroit sales agency will be Turrell & Co, Inc. Formerly Thomas & Betts was represented by Turrell & Benfield, Inc, which has been dissolved and reorganized as two new separate companies.

PRESSITE
an unsized fibreboard having excellent dielectric, physical and chemical properties. Is used principally in air, oil and askarel transformers.
ELECTRITE
a high grade board for electrical insulation, possessing high tensile and dielectric strength. Used in a large variety of punchings and other insulating applications.
West Virginia Fibre Board
FOR ELECTRICAL INSULATION
DENSITE
an extremely hard and tough board of superior quality. Used by many leading manufacturers of electrical equipment to replace the more expensive types of insulating materials.
PULP PRODUCTS DEPARTMENT
WEST VIRGINIA PULP and PAPER COMPANY
230 Park Avenue, New York 17, N. Y. 35 E. Wacker Drive, Chicago 1, Ill.

The Completely NEW More Rugged-Than-Ever 'Jeep'®

NEW, fully-boxed, front cross-member adds to the carrying strength, rigidity and rugged endurance of the frame.

NEW, sturdier body design with sheet metal flanged and overlapped for extra strength . . . center mounted to relieve road strain and for even greater sturdiness.

NEW, larger windshield has approximately 100 sq. in. of additional glass area and folds on stronger hinges. New streamlined hood offers increased visibility.

NEW, softer front seating is form fitting, bucket design with coil springing and gives a more comfortable ride.

Ask your 'Jeep' dealer for a demonstration.

WILLYS MOTORS, INC.
TOLEDO 1, OHIO

'JEEP' • 4-WHEEL-DRIVE TRUCK • 4-WHEEL-DRIVE STATION WAGON • 4-WHEEL-DRIVE PANEL DELIVERY

THE WORLD'S MOST USEFUL VEHICLES

S. L. MUTHS

J. S. EATON

R. M. SHEARER

A. J. WATSON

Mississippi Power Appointees

Several executive advancements and reassignments of duties have been revealed by Mississippi Power Co.

S. L. Muths has been appointed executive vice president and James S. Eaton and R. M. Shearer have been made vice presidents. In other appointments, A. J. Watson was advanced from operating manager to general manager. W. J. Carr, formerly assistant operating manager, replaces Watson.

Muths has been with the company since its beginning in 1925. He was named operating manager in 1935, a director in 1942, a vice president in 1949, and general manager in 1950. Eaton, a member of the law firm of Eaton and Cottrell, the utility's general counsel, is the son of Mississippi Power's first president, the late Barney E. Eaton. Shearer, formerly commercial manager, came to the company in 1925.

Associated with the utility since 1930, Watson assumed the operating manager's post in 1950. Carr has been with Mississippi Power since it started operations in 1925.

Wick Assigned New Executive Duties

Vice President Charles J. Wick will succeed Albert T. O'Neill when he retires as a vice president of the Niagara Mohawk Power Corp on Feb. 1.

A graduate of Canisius College and the University of Buffalo Law School, Wick severed his connection in 1953 with a Buffalo law firm to become affiliated with Niagara Mohawk as a vice president. O'Neill, who is also a director, has been associated with the companies of the Niagara Mohawk System for 45 years.

C. J. WICK

Manage GE Lamp Unit

Top management of completely reorganized Lamp Division of General Electric Co is at the left: D. L. Millham, division's vice president and general manager, is seated at left. Others (seated l to r) are: R. F. Johnson, general manager, Lamp Wire and Phosphor Dept; E. A. Howard, general manager, Lamp Glass Dept; H. L. Weiss, general manager, Large Lamp Dept; C. L. Olson, manager, Advanced Lamp Development Laboratory. Standing (l to r): W. P. Cartun, general manager, Lamp Leads and Bases Dept; D. S. Moore, counsel, Legal Dept; W. R. Gerow, manager, Lamp Equipment Operation; K. G. Reider, general manager, Miniature Lamp Dept; and W. E. Davidson, general manager, Photo Lamp Dept.

WHY IT WILL PAY YOU TO USE BELL SYSTEM COMMUNICATIONS SERVICES

You save money

With Bell System services, you get efficient and dependable communications at low cost. You are relieved of maintenance, depreciation and other costs of privately owned communications.

You get the service you need

It's flexible and complete. We furnish communications tailored to your exact needs. No more, no less. A change in number or type of circuits can be made any time to keep your communications in step with changing needs.

You get the best service

The Bell System is constantly developing new equipment, methods and techniques to improve your service and keep your communications from becoming obsolete.

You have more investment money available

Your capital is *not* tied up in communications equipment but is available for investment in income-producing power equipment and services.

You concentrate on your own business

Our business is entirely communications, and that's one reason the Bell System offers power companies the finest services today. A communications study by specialists, made without charge, frequently indicates how a power company can improve its communications and realize increased benefits and economies. Talk this over with the Bell telephone representative near you.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE

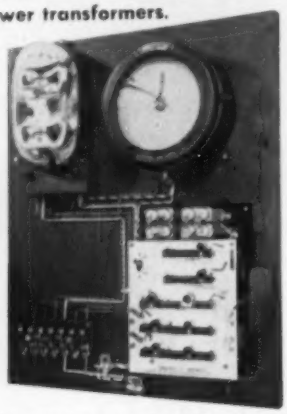
METERING CHANNELS

BELL TELEPHONE SYSTEM

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now FREE

Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.

Puget Sound P&L Advances Scheyer

C. SCHEYER

Appointment of Clarence Scheyer as general sales manager heads a list of personnel changes announced by the Puget Sound Power & Light Co.

Coincident with Scheyer's appointment, Pres Frank McLaughlin revealed that the company is increasing its sales organization by four more sales supervisors and four home service consultants, to assist dealers in the sale of electrical appliances.

In other changes, Howard Carter, superintendent of light and power of the company's Western Division at Bremerton, became assistant to the company's operating manager. Wallace W. Quistroff, assistant superintendent of light and power of the company's Central Division at Renton, was promoted to replace Carter. Charles McGarrigle, local manager of the Renton office, takes on the added duties of supervision of light and power operations.

With the utility for 31 years, Scheyer has been the company's industrial sales director since 1947, after previously working in service, stores and every type of sales assignment.

Carter has held the Bremerton post since 1947, after starting 18 years ago as a clerk in the engineering department. Quistorff, at Renton since 1939, joined the company in 1928 after getting his degree in electrical engineering from the University of Washington. McGarrigle started at Renton as a meter reader in 1923.

Porcelain Products' Executive VP

G. M. RUOFF

Porcelain Products, Inc, Parkersburg, W. Va., has disclosed the election of G. M. Ruoff to the post of executive vice president. Ruoff formerly was vice president and general manager of the High Voltage Insulator Division. He will now assume full authority and responsibility for operation of the entire company, which includes Low Voltage Division at Findlay and Carey, Ohio, as well as the High Voltage Division at Parkersburg.

Dumont Named T&D Superintendent

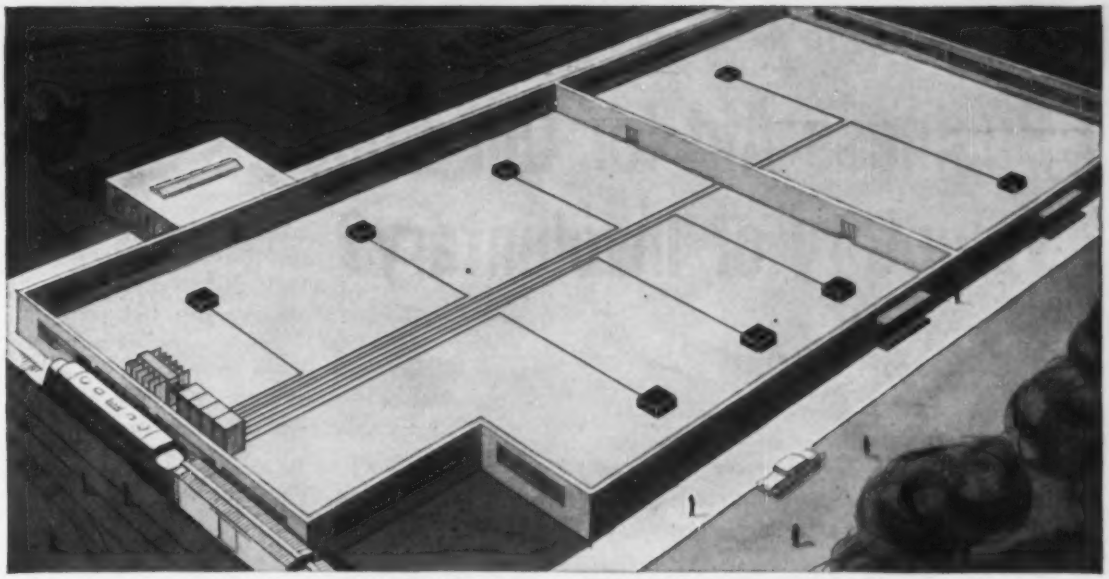
Daniel P. Dumont has been named general superintendent of transmission and distribution of Indiana & Michigan Electric Co. Dumont, a veteran of 27 years' service with the utility, replaces George F. Dequine, who has retired after 43 years in the utility field.

Dumont began his utility career in 1927 as a draftsman of Marion, Ind., with Indiana General Service Co, a predecessor company of Indiana & Michigan Electric. Since 1952 he has been general supervisor of the company's engineering department in Fort Wayne.

D. P. DUMONT

An employee of Indiana & Michigan for more than 30 years, Dequine has been general superintendent of the company's T&D department in Fort Wayne since 1948. He joined the company in South Bend, Ind., in 1924, and was superintendent of the T&D department there for 24 years prior to going to Fort Wayne. Before Dequine became affiliated with I&M, he worked in various capacities for Madison (Wis.) Gas & Electric Co, Eastern Wisconsin Railway & Light Co and Beloit (Wis.) Water, Gas & Electric Co.

How G-E job-planned power systems can help maintain plant efficiency



WHEN INCREASING LOADS CALL FOR A NEW POWER DISTRIBUTION SYSTEM — G-E WIRE AND CABLE WILL GIVE IT THE VERSATILITY NEEDED FOR FUTURE EXPANSION.

The continuing development of new electrical equipment, processes, and materials handling methods doubles the use of electricity approximately every ten years — according to the findings of qualified authorities. This means that you may need a new or expanded distribution system to handle these greater loads efficiently — because the unstable voltages that result from overloads increase distribution and equipment maintenance costs, and result in outages, faulty operation of equipment, and interrupted production.

A General Electric job-planned cable system is designed and coordinated to maintain plant efficiency by accommodating growing and changing load requirements. And G-E cables will keep your installation costs to a minimum, too.

Here are some examples:

85 C Super Coronol* cable provides overload capacity

G-E Super Coronol cable's normal rating (85 C up to 15,000 volts) and its emergency rating (up to 115 C depending on voltage) give you reserve capacity for handling growing loads. This cable, used for lead-ins and cable feeders, can be buried directly in the ground or installed in conduit or ducts.

G-E interlocked armor cable system provides for changes in plant layout

G-E V-c interlocked armor cable primary or secondary feeder systems can be installed quickly, and can easily be expanded or relocated to accommodate changes in load patterns — because each circuit is a separate, flexible cable that needs no conduit. Planned G-E cable systems are of growing importance to an industrial plant, and can have a major effect on the plant's efficiency. So, when you have to handle increasing loads, let your G-E wire and cable specialist help you with the planning. For more information on G-E cable systems, write Section W127-127, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

REWIRE AMERICA ... WITH GENERAL ELECTRIC WIRING SYSTEMS

GENERAL ELECTRIC

FINANCIAL AID TO HIGHER EDUCATION

Business Aid for Our Colleges—Voluntary or Involuntary?

Previous editorials in this series have shown that:

- As a group the nation's independent, privately endowed colleges and universities are in grave financial trouble, and
- There are many different means by which business firms can extend a helping hand to these institutions.

This editorial, one of a series devoted to the financial problems of higher education, submits this proposition: **If business firms do not voluntarily go to the financial aid of higher education, there is every prospect that they will soon be providing more financial support for higher education involuntarily, through taxation.**

If this prospect materializes, one of the basic elements of a well-balanced system of higher education—a strong array of independent colleges and universities—may well be dangerously weakened if not destroyed. And in the process a potentially crucial bulwark for freedom of enterprise in the United States—that same strong array of independent colleges and universities—will be undermined.

Acceptance of these propositions implies absolutely no disparagement of tax-supported colleges and universities. These have an indispensable role in the total system of higher education in the United States. Leaders of these institutions would be among the first to agree that their position is strengthened by a strong system of independent institutions, supported privately rather than by political agencies.

What is the evidence that in one way or another, voluntarily or involuntarily, business will be giving more financial support to higher education? One impressive part of this evidence is provided by the recent rapid increase in the proportion of college and university students attending tax-supported institutions.

Rapid Shift in Enrollment

In the fall of 1952 tax-supported colleges and universities enrolled about 7.5 per cent more students than the independent institutions. In 1953 this percentage was doubled. And in 1954 the tax-supported institutions enrolled 26 per cent more students.

In the case of students entering college for the first time the relative growth of the tax-supported institutions recently has been even more striking. In 1952, the number of beginning students in the tax-supported schools, as reported by the U. S. Office of Education, exceeded those in the independent colleges and universities by 35 per cent. In 1954, just two years later, this figure jumped to 49 per cent.

Why has the proportion of students attending tax-supported colleges and universities been in-

creasing so rapidly? There are many reasons. But a dominant reason is that, in order to keep going at all, the independent institutions have been forced to make large increases in the prices they charge for instruction. The purchasing power of their endowment funds has been cut in half by price inflation. The capacity of the wealthy to supplement their endowments by gifts, as they have done in the past, has been greatly reduced by high taxes. As a result these schools have been forced to rely increasingly on higher prices for instruction (tuition as it is called in academic circles) to make both ends meet.

Since 1940, the independent colleges and universities have raised their tuition fees by an average of about 60 per cent. This is considerably less than the increase of about 100 per cent in prices generally since 1940. And it is nowhere near enough to prevent the faculty members of the independent colleges from faring miserably in terms of salaries, a matter of major national importance to which we shall return in this series. But the increase in tuition fees of the independent colleges has been much greater than the increase in the fees charged by the tax-supported schools. And that price differential increasingly tends to shunt students into the schools which are supported chiefly by taxes. Independent colleges now charge, on the average, about $580 per year for a full course of instruction while the tax-supported institutions charge, on the average, about $240.

Bigger Tax Bill in Prospect

A large increase in the total enrollment in our colleges and universities during the next decade is in prospect, particularly when the great increase in births during World War II is reflected in the number of young men and women of college age. With a total of 2.5 million students at present enrolled in our institutions of higher learning, it is estimated that the total will be over 3 million by 1960.

If this trend continues most of the anticipated increase in college and university enrollment will be concentrated in tax-supported institutions. Indeed, if the shift toward tax-supported institutions that has occurred in the last three years were to continue over the next six years at the same rate, about two million of the three million students anticipated in 1960 would be in tax-supported colleges and universities and one million in independent schools. In 1950 there was a 50-50 division in enrollment. This shift would mean, of course, a corresponding increase in the tax bill for tax-supported education. And of this bill, we can be sure that an ample share would be assessed against business firms.

No Easy Solution

The best way, of course, to put a brake on a soaring tax bill for higher education is to help the independent institutions get in shape financially to carry a larger share of the student load. For most companies the development of a mutually satisfactory program of financial aid for higher education is a complicated process. In fact, it is so complicated that some companies with an initial disposition to provide financial help are inclined to despair of working out a mutually constructive plan.

If, however, the leaders of business will contemplate seriously the only available alternative to their extending voluntary help to our independent colleges and universities, their determination to work out a plan will be strengthened. For that alternative involves a grave weakening of our system of higher education, together with an involuntary increase in the financial support of higher education by business. The increase would come through higher taxes. Contemplation of such an alternative should, if necessary, toughen the will of business firms generally to do everything possible to extend financial help to our independent colleges and universities.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

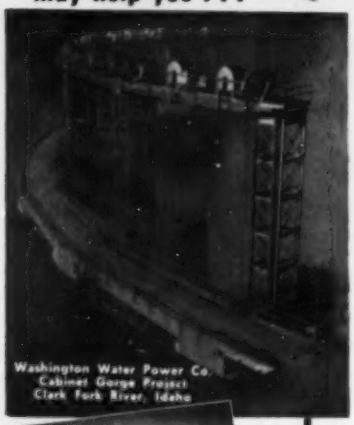
PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

When you plan...

POWER DAM GATES

ask us about design and patterns that may help you . . .



Washington Water Power Co.
Cabinet Gorge Project
Clark Fork River, Idaho

MURCO GATE HOISTS FOR ANY SIZE POWER DAM

MURCO

In planning gates or gate hoists, you may save time and money if you will write us before your over-all plans are complete . . . In over seventy years of designing and building power dam gates and gate hoists, we have developed designs for many gate and gate hoist problems. For that reason, we may have designs and patterns that will fit your special requirements. MURCO gate hoists are designed and built in a wide range of capacities, from less than one ton to over one hundred tons . . . from the smallest hand operated to the largest motor operated gate hoist.

We also build gate hoists to fit your plans and specifications. Write for complete information and Engineering Department recommendations.

D. J. MURRAY MANUFACTURING CO.

Manufacturers Since 1883

WAUSAU - WISCONSIN

Ashworth, McShane Are Elevated

Paul P. Ashworth has been advanced to the newly created position of executive vice president of Telluride Power Co, Richfield, Utah. O. C. McShane, assistant general manager, has been appointed general manager to succeed Ashworth.

Ashworth's new duties involve company policy, system planning, and power supply. However, he will continue to have full supervision over the operations of the company. McShane will take over the supervision of personnel and the detailed operations of the utility. Both men joined the company as power plant operators. Ashworth joined the original Telluride Power company in 1906, while McShane began in 1916.

PERSONALS

Alexander C. Boisseau has been named as manager of a new $20 million distribution transformer manufacturing plant to be built by General Electric Co in Hickory Newton-Conover area of North Carolina. Boisseau has been manager of GE's Holyoke, Mass., distribution transformer plant. . . Westinghouse Electric International Co has appointed these executives: **G. L. Wilcox,** executive vice president; **D. E. Akins,** vice president; **R. D. McManigal,** vice president in charge of sales; and **J. D. Mickle,** vice president of Westinghouse Electric Co of Brazil, an International subsidiary. . . **Guy Barclay** has been made light and power superintendent for British Columbia Electric Co's Vancouver Island operations department to replace **G. F. Green,** who moved to Vancouver to be supervisor of protection and communication in the company's electrical system.

H. E. Chambliss has retired as chief engineer of Montana Power Co. His successor is **Ray M. Ball,** who has served in the utility's general office engineering department since 1936. . . Eisler Engineering Co, Newark, N. J., has named Vice Pres **Charles Eisler, Jr,** as president to replace **Dr Charles Eisler,** who moves up to board chairman. . . Federal Pacific Electric Co, Newark, N. J., has appointed **Howard D. Tindall** as manager of its Transformer Division, where his duties include management of Gardner Electric Manufacturing Co, San Francisco, a wholly owned subsidiary of Federal Pacific. Tindall formerly was a vice president of Moloney Electric Co.

Chief Engineer **D. C. Hormell** of Pioneer Service & Engineering Co, Chicago, has also assumed the post of vice president. . . **W. Howard Miller,** formerly assistant vice president of National City Bank of New York, has been elected a vice president to be associated with the Public Utility Department. . . **S. D. Payzer,** who has served D. J. Murray Manufacturing Co, Wausau, Wis., as chief engineer, has been assigned to the newly created post of vice president in charge of engineering.

MEETINGS CALENDAR

Week of Jan. 23-29

DOBLE ENGINEERING CONFERENCE

22nd Annual Meeting, Sheraton Plaza Hotel, Boston, Jan. 24-28.

CENTRAL TEXAS MUNICIPAL UTILITIES INSTITUTE

2nd Annual Electrical Appliance Dealers Conference, Commodore Perry Hotel, Austin, Tex., Jan. 25.

CANADIAN ELECTRICAL ASSN.

Eastern Zone, All Divisions, Sheraton-Brock Hotel, Niagara Falls, Ont., Jan. 25-28.

PACIFIC COAST ELECTRICAL ASSOCIATION

Business Development Section, Hotel California, Fresno, Calif., Jan. 27-28.

Week of Jan. 30-Feb. 5

EDISON ELECTRIC INSTITUTE

Power and Heating Committee, Atlanta Biltmore Hotel, Atlanta, Ga., Jan. 31-Feb. 1; Prime Movers Committee, Grand Hotel,

(*Continued on page* 269)

Part of a set of 16 field coils recently completed by National for a 25,000 KVA waterwheel generator. Note the complete pole assembly ready for mounting on the rotor.

New or rebuilt field coils by National mean *better than new* performance

Salient pole field coils deteriorate in time and require rebuilding or replacing. They are subject to copper growth, lead breakage, shorts between turns, looseness on poles, collar breakage, breaking apart of turns, and grounding to pole pieces.

Corrective measures include the use of silver bearing copper, flexible leads, Class 'B' turn and pole piece insulation, and asbestos bakelite collars and staggered turns for better heat dissipation and longer life.

Trained personnel and heavy specialized equipment are at your command to expeditiously repair, rebuild or replace large fields; road service men are available to remove and reinstall the pole piece and coil assemblies on the rotor and to dynamically balance.

Write, wire, or call National, or get in touch with your nearby National field engineer.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS; MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

PROFESSIONAL SERVICES

Consulting **Management** **Designing** **Inspections**
Accounting **Appraisals** **Testing** **Cost Analysis**
Valuations **Construction** **Financing** **Investigations**

(Continued on page 270)

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
56 State Street, Albany, N. Y.

BLACK & VEATCH

Consulting Engineers

Electricity—Water—Sewage—Industry

Reports, Design, Supervision of Construction, Investigations, Valuation and Rates

4706 Broadway Kansas City 2, Missouri

THEODORE D. BROSS & COMPANY

Steel Tower & Wood Transmission Lines

Distribution & Maintenance

175 Enfield St. Hartford, Conn.

DAY & ZIMMERMAN, INC.

Engineers

Design - Construction - Management
Investigations and Reports

New York Philadelphia Chicago

Doble Engineering Company

Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 944, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr. Chicago, Ill.

Ebasco Services Incorporated

Engineers - Constructors - Business Consultants

Design and Construction
Financial and Operating Consultation
Investigations and Reports
Consulting Engineering

Two Rector Street New York
Chicago • Washington, D. C.

ELECTRICAL TESTING LABORATORIES, INC.

Electrical, mechanical, photometric, radiometric and chemical laboratories, rendering testing, research and associated services, including certification, inspections at factories and field investigations.

3 East End Avenue at 79th St., New York 21, N. Y.

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Construction & Maintenance

Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers

45 Griswold St. Binghamton, N. Y.

FORD, BACON & DAVIS

Engineers

DESIGN • CONSTRUCTION
VALUATIONS • REPORTS

New York • Chicago • Los Angeles

GILBERT ASSOCIATES, Inc.

Engineers • Consultants • Constructors
Reading, Pa.

Engineering and Design • Construction Supervision
Industrial • Sanitary • Safety
Chemical Laboratory Services
Business and Economic Research
Industrial Relations • Purchasing

New York Philadelphia Washington
Rome Manila Medellin

HARZA ENGINEERING CO.

Consulting Engineers

Calvin V. Davis E. Montford Fucik
Richard D. Harza

Hydroelectric Plants and Dams
Transmission Lines
Flood Control, Irrigation
River Basin Development

400 West Madison Street Chicago 6

HOOSIER ENGINEERING COMPANY

Erecting Engineers
Transmission Lines, Substations

1384 Holly Avenue, Columbus, Ohio

S. E. HUEY & CO.

Engineers & Surveyors

SURVEYS FOR ENGINEERS

Monroe Louisiana

JACKSON & MORELAND

Engineers and Consultants

Design and Supervision of Construction
Reports—Examinations—Appraisals
Machine Design—Technical Publications

Boston New York

M. W. KELLOGG

Piping System Design Analyses

Unique piping system model tester as well as modern IBM card programming computer available for low cost, accurate analyses of the most complex piping systems.

The M. W. Kellogg Company,
225 Broadway, New York 7, N. Y.

THE KULJIAN CORPORATION

Engineers - Constructors - Consultants

POWER PLANT SPECIALISTS
(Steam, Hydro, Diesel)

Utility • Industrial • Chemical
1200 N. Broad St., Philadelphia 21, Pa.

N. A. LOUGEE & COMPANY

Engineers and Consultants

REPORTS — APPRAISALS
DEPRECIATION STUDIES — RATE CASES
BUSINESS AND ECONOMIC STUDIES

120 Broadway New York

LUCAS & LUICK

Engineers

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

THE LUMMUS COMPANY

Engineers and Constructors

385 Madison Ave., New York, N. Y.

Chicago . . Houston . . London
Paris . . The Hague . . Montreal
Caracas . . Bombay

LUTZ & MAY

Consulting Engineers

STEAM, GAS & DIESEL POWER STATIONS
PUMPING PLANTS — ELECTRIC SYSTEMS
REPORTS — DESIGN — APPRAISALS

1009 Baltimore Kansas City 6, Mo.

CHAS. T. MAIN, INC.

Engineers

Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals

Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers . . Purchasing . .
Specialists in Financing
Accounting and Other Operations

231 So. La Salle St. Chicago 4

Recording & Statistical Corp.

BILL ANALYSIS—CONSUMPTION STUDIES

THE ONE-STEP METHOD
(exclusive with R&S)

100 Sixth Ave. WOrth 6-2700 New York 13, N. Y.

REIS & CHANDLER, INC.

ADVISORS TO UTILITIES

Financing—Rate of Return

30 Vesey Street. New York 7, N. Y.

Meetings Calendar

(*Continued from page 266*)

Mobile, Ala., Jan. 31-Feb. 1; Home Service Committee, Washington, D. C., Feb. 4-5.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Winter General Meeting, Hotel Statler, New York, Jan. 31-Feb. 4.

AMERICAN SOCIETY FOR TESTING MATERIALS

Annual Committee Week, Netherland Plaza Hotel, Cincinnati, Ohio, Jan. 31-Feb. 4.

***INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL**

Farm Power Use Workshop Conference, Sheraton Hotel, St. Louis, Feb. 3-4.

MISSOURI VALLEY ELECTRIC ASSOCIATION

Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 3-4.

Week of Feb. 6-12

EDISON ELECTRIC INSTITUTE

Accident Prevention Committee, Shoreham Hotel, Washington, D. C., Feb. 9-10; Transmission and Distribution Committee, Shoreham Hotel, Washington, D. C., Feb. 10-11.

PENNSYLVANIA ELECTRIC ASSOCIATION

Winter Meeting, Transmission and Distribution Committee, Hotel Roosevelt, Pittsburgh, Feb. 10-11.

***INSTITUTE OF RADIO ENGINEERS**

7th Annual Southwestern Conference and Electronics Show, Baker Hotel, Dallas, Tex., Feb. 10-12.

Week of Feb. 13-19

***NATIONAL ASSOCIATION OF PURCHASING AGENTS**

24th Annual Mid-Winter Conference, Public Utility Buyers' Group, Shamrock Hotel, Houston, Tex., Feb. 13-15.

***EDISON ELECTRIC INSTITUTE**

Industrial Relations Committee in conjunction with AGA at AMA Mid-Winter Personnel Conference, Palmer House, Chicago, Feb. 14; Electrical Equipment Committee, Deshler Hilton Hotel, Columbus, Ohio, Feb. 14-15; Commercial Electric Space Heating and Air Conditioning Committee, St. Louis, Feb. 17-18; Residential Promotion Committee, New York, Feb. 17-18; Accounting Conference, Planning, Edgewater Beach Hotel, Chicago, Feb. 17-18.

***PENNSYLVANIA ELECTRIC ASSOCIATION**

Winter Meeting, Prime Movers Committee, Roosevelt Hotel, Pittsburgh, Feb. 14-15; Winter Meeting, Relay Committee, Hotel Roosevelt, Pittsburgh, Feb. 15-16; Winter Meeting, Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Feb. 17-18.

***NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION**

Annual Meeting, Convention Hall, Atlantic City, N. J., Feb. 14-17.

*Additions this week.

If . . .

YOU CHANGE YOUR ADDRESS

Be sure to notify us so that future copies of ELECTRICAL WORLD will be delivered promptly.

Also make certain you advise your local Postmaster so other important mail doesn't go astray. Both the Post Office and we will thank you for your thoughtfulness.

Send your new and old address to:

Subscription Dept.

ELECTRICAL WORLD

330 W. 42nd St.
New York 36, N. Y.

PACKAGED SUNLIGHT FOR NIGHT REPAIRS

Emergency repairs can be accomplished with more speed and greater safety with YELLOW LINEMEN'S FLARES. They provide instantaneous illumination whenever and wherever needed.

RED WARNING FLARES are unmistakable warning signals. Unequalled for the protection of motorists, pedestrians, utility employees and parked equipment.

Special Introductory Offer

Case of 36 Red and 36 Yellow, 30 minute Flares..... $23.00

Contact your pole line supplier or write:

STANDARD RAILWAY FUSEE CORP.
Signal Flare Division
Box 30-E Needham Heights 94, Mass.

send for this catalog describing acker's new all-purpose digger

Send the coupon today for your copy of our new catalog showing the wide range of application as well as the many exclusive features that make the *Acker All-Purpose Digger* the most versatile and useful you can buy!

TWO MODELS TO CHOOSE FROM — Jeep mounting with compact, power take-off or skid-mounted with self contained power plant for truck mounting.

ACKER DRILL CO., Inc.
725 W. Lackawanna Avenue, Scranton, Penna.
Please send me free copy of Bulletin 40. EW.

Name_____ Title_____
Firm_____
Street_____
City_____ State_____

PROFESSIONAL SERVICES

(Continued from page 268)

SANDERSON & PORTER

Engineers and Constructors Reports and Surveys

New York — New York

SARGENT & LUNDY

ENGINEERS

140 South Dearborn St.

Chicago, Ill.

F. W. SCHEIDENHELM

Consulting Engineer

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals.

80 Church Street, New York 7, N. Y.

F. A. TUCKER, INC.

Contractors—Engineers

specialize in

Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams

Main Office—814½ Center Street, Rutland, Vt. Branch Office—114 East 3rd St., Charlotte, N. C.

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance

Transmission - Distribution
Electric and Telephone Lines
Consultants

646 York Road — Jenkintown, Pa.

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

"By reason of special training, wide experience and tested ability, coupled with professional integrity, the consulting engineer brings to his client detached engineering and economic advice that rises above local limitations and encompasses the availability of all modern developments in the fields where he practices as an expert. His services, which do not replace but supplement and broaden those of regularly employed personnel, are justified on the ground that he saves his client more than he costs him."

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

RATES

UNDISPLAYED	DISPLAYED
$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.	EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Display Style. *Individual Spaces* with border rules for prominent display of advertisements. The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. *An advertising inch* is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.
POSITION WANTED, undisplayed rate is one-half of above rate, payable in advance.	
Box Numbers—Care of publication count as one line.	
Discount of 10% if full payment is made in advance for 4 consecutive insertions.	

SEND NEW ADVERTISEMENTS TO: 330 W. 42 St., N. Y. 36, N. Y., for February 7th issue closing January 28th

FOREIGN SERVICE

RELAY TECHNICIANS

Qualified Journeyman Electrician with minimum 2 years' experience as a Relay Technician investigating and correcting power line circuit troubles caused by relay failures.

UTILITIES OPERATORS

Minimum 4 years' Journeymen experience in Power Plant and Utilities embracing air conditioning, refrigeration, water and sewage disposal—Municipal Sewage License very desirable.

Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 101
ARABIAN AMERICAN OIL COMPANY
505 Park Avenue
New York 22, N. Y.

ELECTRICAL ENGINEERS

A well-known Eastern oil company has several openings on the staff of its Engineering & Construction Dept. for graduate Electrical Engineers experienced in design, construction, installation, performance and application of electrical power generating and consuming equipment and related distribution systems and auxiliary equipment. Assignments will include such diversified items as refinery units and equipment, service stations, marine terminals, office buildings, bulk plants and pipe lines. If you are looking for a position that affords interesting work and advancement opportunities, send resume and salary requirements. Replies will be held in strict confidence.

E. T. ADDISON
P. O. Box 7258, Philadelphia 1, Pa.

WANTED
DISTRIBUTION ENGINEER

To head up this activity on a system basis with a rapidly growing medium-size midwest utility company. Must be a graduate engineer with considerable experience in distribution, planning and construction. Send resume of experience and qualifications to

P-5045, Electrical World
330 West 42nd Street, New York 36, New York

ELECTRICAL and MECHANICAL ENGINEERS

Positions available in Transmission Line Design, Distribution Investigations and Substation Design. Want men with less than five years experience. Excellent employee benefits and promotion from within.

Write to: Mr. R. E. Beatty,
CONSUMERS POWER COMPANY
212 W. Michigan Ave., Jackson, Michigan
Michigan

GENERAL MANAGER

Required for the Saskatchewan Power Corporation operating a rapidly expanding electrical utility and an extensive gas utility in the province of Saskatchewan, Canada. Headquarters Regina, Saskatchewan. Kindly state fully background and experience including previous training in and knowledge of electrical and gas utilities and industrial and public relations. State also salary expected and date available. Address replies to:

A. E. BLAKENEY
1730 Scarth St. Regina, Saskatchewan, Canada

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

DISTRIBUTION ENGINEERS — Competent graduate electrical engineers with at least 10 years experience design, operation and maintenance of distribution facilities required by rapidly growing utility desirable location South America. Portuguese or Spanish useful—not required to start. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5213, Electrical World.

DISTRIBUTION ENGINEERS — Graduate Electrical Engineers — Senior — at least 10 years field experience with operating utility company, Junior 3 years experience. Permanent position long established consulting organization New York. Some travel Latin America necessary in future. Knowledge of Spanish or Portuguese useful. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-5214, Electrical World.

PUBLIC SERVICE Company of New Mexico has position open for Graduate Electrical Engineer capable in distribution, substation and transmission work with minimum experience of five years and under forty years of age. Job will be fifty percent field work. Send full particulars and asking salary to Walter J. Dolde, P. O. Box 1360, Albuquerque, New Mexico.

EMPLOYMENT SERVICES

SALARIED PERSONNEL $3,000-$25,000. This confidential service established 1926., is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

(Continued on opposite page)

EMPLOYMENT SERVICES
(Continued from opposite page)

SALARIED POSITIONS $5,000 to $35,000. We offer the original personal employment service (established 45 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 658 Brisbane Bldg., Buffalo, N. Y.

POSITIONS WANTED

ELECTRICAL ENGINEER—BSEE 6 years experience power systems planning, relaying, design and construction, desires position in central U. S. Age 33. PW-5122, Electrical World.

POWER PLANT engineer—B.S.M.E., 29, married, vet., 3½ yrs. exp. H. P. reheat operation, maintenance, testing, construction. Desires utility or industrial opportunity. PW-5243, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash Ashley 24 E. 21, N.Y.C. (10).

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4334) will be received at Denver, Colorado, until March 3, 1955, for furnishing one 10,000-kva, 110,000- to 34,500-volt, 3-phase, class OA, outdoor power transformer, having a 12,500-volt, 3,500-kva tertiary winding, and equipped with tank-mounted arresters and with automatic load-ratio-control equipment for low-voltage winding for Yankton Substation, South Dakota, Missouri River Basin Project. Delivery is desired within 360 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado. W. A. Dexheimer, Commissioner.

MANUFACTURERS REPRESENTATIVES WANTS ADDITIONAL LINES

for Pole Line Hardware—Insulators—Connectors—Transformers—Outdoor Switches and Outdoor Sub Stations and etc. Also equipment and components approved for Rural Telephone Association line construction.

RA-5196, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

At Your BUSINESS Service:

The Classified Advertising Sections (Searchlight Sections) of McGraw-Hill publications are at your service for the satisfying of almost every business need or want.

Because these publications are specialized in the field that they cover, your classified advertising of used or surplus new equipment, of securing a position or personnel, of offering or securing business opportunities will reach the right men, quickly and economically.

Classified Advertising Division

McGRAW-HILL PUBLICATIONS, Inc.

330 W. 42nd St., New York 36, N. Y.

DIESEL POWER

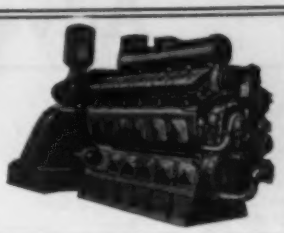
IMMEDIATE SHIPMENT

• PURCHASE OR RENTAL

UNIT CAPACITIES—10 TO 2475 KVA

A.C.—50 AND 60 CYCLES

• ALSO D.C. UNITS



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1180	Worthington	SEH-8	1685	360	320	Superior	60E-6	460	450
1136	Fairbanks Morse	38D	1600	720	300	General Motors	8-268A	450	1200
1100	General Motors	16-278A	1600	720	250	Clark	GD-4	375	360
750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-8	1000	327	175	General Motors	12-71	275	1800
600	General Motors	12-567	860	600	150	Worthington	CC-4	225	450
500	General Motors	8-567	720	720	150	Buckeye	80	240	600
500	Alco	6-12 rx13T	750	600	148	Fairbanks Morse	32E14	220	300
350	Baldwin	VO-6	510	450	100	General Motors	3-268A	150	1200
320	Enterprise	DSO-6	460	450	60	General Motors	6-71	90	1200

A. G. SCHOONMAKER COMPANY, INC.

DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED

(APPARATUS EXCHANGE)

Two Rector St., New York 6, N. Y.

TRANSFORMERS

FOR SALE

3—1000 KVA Mol. 13200-2400/4160Y
5—1000 KVA Mol. 11500-2400/4160Y
3— 833 KVA G-E 35000—480
3— 500 KVA G-E 26400—240/480
5— 333 KVA W-H 38000-7200/13470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/-11950Y
3— 333 KVA G-E 33000-2300/4000Y
3— 333 KVA Mol 7200/13470Y-2300/4160Y
9— 200 KVA W-H 13200-230/460
3— 150 KVA G-E 19050/33000Y-2540/4000Y
5— 150 KVA G-E 7200/13470Y-240/480
9— 100 KVA G-E 33000-6900/11950Y

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

Cincinnati 27, Ohio

40 Years Dependable Service

ELECTRICAL **WIRE** AND **CABLE**

—Your Best Source—
• for every industrial and power application
• Odd lengths—long and short—reasonably priced
• **LARGEST STOCK IN MIDWEST**
Let us quote on requirements—send your inquiries
We'll also buy your Surplus
Branch Offices:
Houston— Yukon 8547 Los Angeles— Angelus 3-8148

UNIVERSAL Wire and Cable Co.
2952 N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Cable: UNIWIRE

Specialist for 47 Years in—

LARGE POWER EQUIPMENT

Do you receive our stock list? Prompt shipment from inventory. A.C. & D.C. Motors, Transformers, M-G Sets, Frequency Changers, Controls, Turbo-Generators and Circuit Breakers. Attractive prices for rebuilt-guaranteed equipment. Contact us before purchasing.

BELYEA COMPANY, INC.

51 Howell St. Jersey City 6, N. J.

Somebody—Somewhere,

needs your idle equipment! Reach that buyer quickly and economically thru the

"SEARCHLIGHT SECTION"

The meeting place of Used Equipment Buyers and Sellers

Advertising In This Issue

Acker Drill Co., Inc. 269
Air Preheater Corp., The 56
Allis-Chalmers Mfg. Co. ..... 2nd Cover
22, 35, 36, 37 38
American Brass Co., The 205
American Bridge Div. United States Steel Corp. 241
American Creosoting Co. 64
American Telephone & Telegraph Co. 261
Anaconda Wire & Cable Co. 226, 227
Anderson Brass Works, Inc. 61
"Automatic" Sprinkler Corp. of America 224
Asplundh Tree Expert Co. 39

Babcock & Wilcox Co., The 94, 95
Bailey Meter Co. 242, 243
Bakelite Co. Div. Union Carbide & Carbon Corp. 40, 41
Baltimore & Ohio Railroad 277
Bell Aircraft Corp. 194
Biddle Co., James G. 65
Blackburn Corp., Jasper 97
Brewer-Titchener Corp., The 100
Bristol Co., The 104
Brown Boveri Corp. 281
Burndy Engineering Co., Inc. 79

Central Transformer Corp. 203
Chase Brass & Copper Co. 84
Chevrolet Div. General Motors 77
Cochrane Corp. 8
Cole Electric Co. 284
Collins Radio Co. 34
Combustion Engineering Inc. 48, 49
Consolidated Treating Co. 12
Continental-Diamond Fibre Co. 92
Control Corp. 250
Cope Inc., T. J. 93
Copperweld Steel Co. 25
Cornell-Dubilier Electric Corp. 200, 201
Crescent Tool Co. 253
Cyclone Fence Dept. United States Steel Corp. 237

DeLaval Steam Turbine Co. 239
Directory of Engineers 268, 270
Dow Chemical Co., The 207
Duncan Electric Mfg. Co. 60
du Pont de Nemours & Co., (Inc.) E. I. Polychemicals Dept. 23

Eastern Specialty Co. 262
Ebasco Services, Inc. 279
Electric Controller & Mfg. Co., The 195
Electric Service Mfg. Co. 68, 69
Electrical Engineers Equip. Co. 225
Electrical Testing Laboratories, Inc. 24
Electroline Company 5
Electro Motive Div. General Motors 66
Electro Switch Corp. 238
Engineers, Directory of 268, 270

Fargo Mfg. Co., Inc. 185
Federal Pacific Electric Co. 3rd Cover
Fisher-Pierce Co., Inc. 193
Fluor Corp., Ltd., The 273
Foster Wheeler Corp. 28, 29
Four Wheel Drive Auto Co. 26, 27
Frost Forest Products Div. Olin Mathieson Chemical Corp. 9

General Electric Co.
Apparatus Dept. 71, 72, 73, 74, 75
76, 173, 174, 175
176, 179, 233, 234, 235, 236
Construction Materials Div. 263
Electronics Dept. 58
Lamp Div. 229
Major Appliances Div. 180, 181
Gilbert Associates, Inc. 240
Gould-National Batteries, Inc. 221
Gulf Oil Corp. 32, 33
Guth Co., The Edwin F. 83

Hazard Insulated Wire Works 4
Hi-Voltage Equipment Co. 13
Holophane Co., Inc. 15
Hoosier Engineering Co. 199
Hotpoint Co. 80
Hubbard Aluminum Products Co. 218, 219

Indiana Steel & Wire Co., Inc. 252
Ingersoll-Rand 249
I-T-E Circuit Breaker Co. 62, 63

Johns-Manville 78, 232
Joslyn Mfg. & Supply Co. 91

KPF Electric Co. 106
Kaiser Aluminum & Chemical Sales Inc. 30, 31
Kearney Corp., James R. 105
Kellogg Co., The M. W. 103
Kimble Glass Co., Sub Owens-Illinois 96
Klein & Sons, Mathias 198
Koppers Co., Inc. 228
Kuhlman Electric Co. ..... 4th Cover

Lapp Insulator Co., Inc. 67
Line Material Co. 43, 44, 45, 46, 47

Macallen Co., The 257
Malleable Iron Fittings Co. 16
Mallory & Co., Inc., P. R. 42
Marcus Transformer Co., Inc. 244
McCabe-Powers Auto Body Co. 52, 53
Minneapolis-Honeywell Regulator Co., Industrial Div. 230, 231
Moloney Electric Co. 108
Morrison Steel Products Inc. 190
Murray Mfg. Co., D. J. 266

National Electric Coil Co. 267
Natvar Corp. 14
Neils Lumber Co., J. 70
Nelson Electric Mfg. Co. 101
Newport News Shipbuilding & Dry Dock Co. 107

Okonite Co., The 4
Orangeburg Mfg. Co., Inc. 255

Pacific Coast Engineering Co. 245
Palnut Co., The 217
Pennsylvania Transformer Co. 188, 189
Philadelphia Gear Works, Inc. 88
Philco Corp., Industrial Div. 10, 11
Porcelain Products, Inc. 20, 21
Preformed Line Products Co. 222 223

Pritchard & Co., J. F. 57
Pyrene-C-O-Two 90

RT&E Co. 206
Radio Corp. of America 17
Reliable Electric Co. 89
Revere Copper & Brass, Inc. 183
Richardson-Allen Corp. 204
Riley Stoker Corp. 18, 19
Roebling's Sons Corp., John A. 191
Rome Cable Corp. 54, 55

S&C Electric Co. 6, 7
Searchlight Section 270, 271
Simplex Wire & Cable Co. 197
Smith Co., S. Morgan 86
Southern States Equipment Corp. 59
Standard Oil Co., (Indiana) 85
Standard Railway Fusee Corp., Signal Flare Div. 269
Subox, Inc. 248
Superior Switchboard & Devices Co. 258
Sylvania Electric Products, Inc. 251

Tel-E-Lect Products, Inc. 246
Thiel Tool & Engineering Co. 256
Thomas & Sons Co., R. 87

USCO Power Equipment Corp. 192
Union Carbide & Carbon Corp., Bakelite Co. 40, 41
United States Rubber Co. 50, 51, 102
U. S. Hoffman Machinery Corp. 81

Victor Insulators, Inc. 187

Wagner Electric Corp. 98, 99
Westinghouse Electric Corp. 209, 210
211, 212, 213, 214
215, 216, 247, 275
Weston Electrical Instrument Corp. 82
West Virginia Pulp & Paper Co. 259
Willys Motors, Inc. 258, 259

York-Hoover Corp. 220

■

PROFESSIONAL SERVICES 268, 270

■

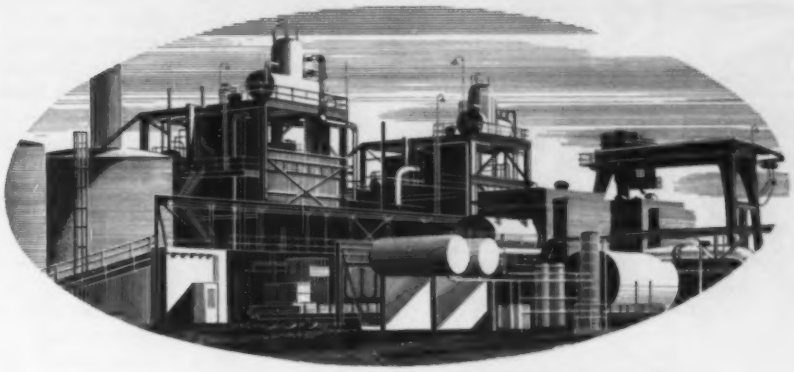
SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 270
Positions Wanted 271
Selling Opportunities Wanted 271
Employment Services 270

NOTICES
Proposal 271

EQUIPMENT
(Used or Surplus New)
For Sale 271

Fluor assumes undivided responsibility



for power plant engineering—construction

Fluor is one of the nation's major contractors with an excellent engineering and construction record for the power industry. With access to four engineering offices located at Los Angeles, Houston, New York City and Niagara Falls, Ontario, plus two manufacturing plants and construction depots (Los Angeles and Paola, Kansas), Fluor has a large reservoir of talent, facilities and equipment at their disposal.

Fluor not only provides design, engineering, purchasing and construction under a single responsibility, *but guarantees the price*. Because of a large, well-integrated organization, Fluor can write any type of contract desired, doing business on *your* basis. Generally these contracts fall into one of these three broad classifications:

LUMP SUM OR "TURNKEY"

In this contract, Fluor assumes complete responsibility for all details from design to initial plant operation. Fluor becomes the sole contractor at a firm figure agreed upon in advance. Only by dealing with one reliable firm can the full benefits of a "turnkey" contract be realized. The tremendous time-saving advantages alone result in a lower, overall price with a guaranteed, in-service date.

GUARANTEED MAXIMUM

This contract (also known as "maximum price with a division of savings") is based upon cost plus a fixed fee. The price to the customer cannot be exceeded—it is *guaranteed*. But if savings are effected during the job, they are divided proportionately between the customer and Fluor. The customer never pays more than the agreed price and he may pay less. Under a "Guaranteed Max" contract, it is to the advantage of both parties to get the plant in operation as quickly and as economically as possible.

COST PLUS

On certain projects which cannot be sufficiently defined, the cost plus contract will apply. Under this contract (also called "open end"), the customer reimburses Fluor for all "out-of-pocket" costs during the job, and pays a fee for Fluor's services.

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
LOS ANGELES 22, CALIFORNIA

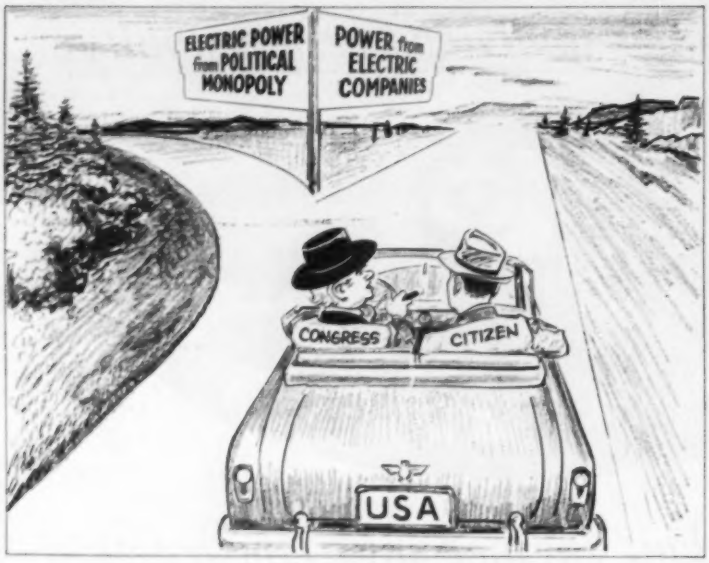
FLUOR OF CANADA - TORONTO
FLUOR PERUANA, S.A. - LIMA
HEAD WRIGHTSON - LONDON

ENGINEERS
CONSTRUCTORS
MANUFACTURERS

NEW YORK
CHICAGO
PHILADELPHIA
BOSTON
PITTSBURGH
SAN FRANCISCO
HOUSTON
BIRMINGHAM
TULSA
DENVER

Fluor is one of a very few firms who write all of these contracts. Before you build, investigate all three. We welcome your inquiries.

PUBLIC RELATIONS & ADVERTISING



'Straight or Left, Mister'

The line above is the tag line for the cartoon which is being furnished as a special mat service offering of the Electric Companies Advertising Program. This is one of two such cartoons put out by ECAP dealing with the basic problem confronting the industry in the Dixon-Yates controversy. Advertising copy accompanying the cartoon says the straight road represents the business way of doing the job. The left turn represents the federal government monopoly way of doing it.

Essay Contest on Farm Power Use Announced

Wisconsin Public Service Corp will award University of Wisconsin scholarships to 13 farm youths who submit the best essays on "Use of Electricity on Wisconsin Farms."

The scholarships, valued at $240 each will cover all charges made by the university for its annual 15-week farm short course. They will be given to winners in 13 separate county-wide contests the company will conduct in its service area. Second and third prizes of $50 and $25 U. S. savings bonds also are scheduled.

Ad Men, Take the Cure

Folder circulated by Public Utilities Advertising Association reminds members:

"There are two ways for PUAA-ers to remedy a bad headache.

1. "Take a couple of these aspirins and get to bed." (Two aspirin tablets in cellophane envelope are attached to folder.)

2. "Win awards in the P. U. A. A. Better Copy contest."

Deadline for entries is Feb. 1. For annual report entries, April 1.

TV Titles for February

"You Are There" television program, sponsored by Electric Companies Advertising Program and Prudential Insurance Co, will carry the following shows during February:

Feb. 6—"The Signing of the Declaration of Independence."

Feb. 13—"The Tragic Hour of Dr Demmelweis."

Feb. 20—"The Liberation of Paris."

Feb. 27—"Washington's Farewell to His Officers."

Cleveland Co Sponsors Color Movie on Seaway

"Land of Promise," a new sound-color film depicting the anticipated impact of the St. Lawrence Seaway on northeast Ohio, will be presented at a civic preview Jan. 28 at Cleveland's Public Music Hall.

The film was made by Cleveland Electric Illuminating Co as a part of its employee and community relations program. It presents a panorama of local and industrial activities, together with a selection of civic and cultural centers in Cleveland and the northeast Ohio area. It also makes some predictions as to the impact of the seaway on them.

Civic preview of the film will have all of the trappings of a regular Hollywood production. Three thousand area leaders in business, labor, education, civic affairs, and public life will attend the presentation. Elmer L. Lindseth, president of the company, will introduce the movie.

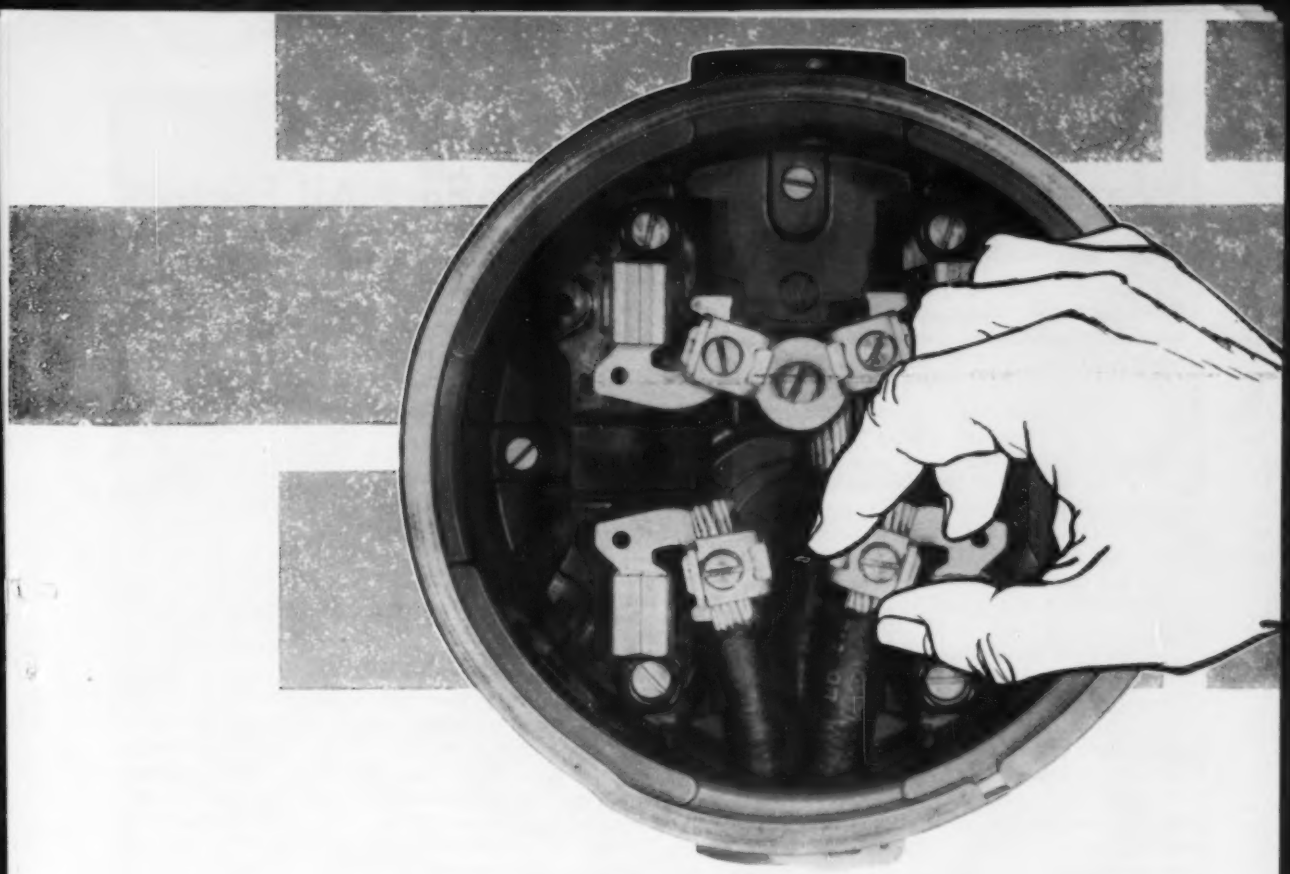
Scanning the Ads

Carolina Power & Light Co—"It adds up to Confidence" is the punch line for an ad based on service dependability. It is illustrated by a hand turning on a wall switch.

Consolidated Edison Co of N. Y.—Company is continuing its atomic educational campaign with an ad showing a bowler letting go a ball. Caption explains there is enough usable energy stored in a piece of uranium the size of a bowling ball to produce electricity for the New York area for two full weeks.

Metropolitan Edison Co—"Take it from your pots and pans," says an ad. "Electric cooking is cleaner."

Northern States Power Co—Twenty-year sales and revenue charts illustrate company statement that diversification brings 21 straight years of revenue growth. Simple chart-table illustrates diversity of company customers among rural-residential, commercial, industrial classifications.



New meter socket simplifies wiring

The new Westinghouse die-cast aluminum meter socket slashes installation time because it is roomier and has self-aligning terminals which accommodate up to #0 conductors. These large conductors which are too stiff for easy bending are now being used to handle today's growing loads.

The new Westinghouse bus-type terminals swivel for easy alignment with the conductors. On installations using heavy conductors, the tops of the terminals may be removed, conductors are simply dropped into place, and the tops replaced. The swivel feature of the terminals also contributes to the ease of inserting smaller wire sizes.

The socket has outside hubs to give more room inside for wiring. Terminals have large contact surfaces with "follow" action, insuring a solid connection on aluminum or copper conductors. All sockets have a breakout in the back for use when three-point mounting is required.

A new iridited-aluminum sealing ring which can be installed without tools is supplied with this socket. The socket is available for either single or polyphase service, with 2 or 3 outlets, in 1-inch, 1¼-inch and 1½-inch hub sizes. For more information, write to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania, for a copy of B-6377. J-40461

Terminals swivel to align with conductors.

The ring can be applied without the use of tools.

YOU CAN BE SURE...IF IT'S

Westinghouse

READERS FORUM

Water Heating Rates Must Reflect All Factors

To the Editor:

I have read with interest your editorial, "Control of Residential Loads," which appeared in the Nov. 1, 1954, issue. The following thoughts occur to me on this water heater question:

1. The diversified load factor of the uncontrolled water heater is good. However, it is no better than a number of other appliances used in the home. Consequently, we are of the opinion that the uncontrolled water heater should be billed on the regular residential rate that is available for all other uncontrolled service. Our experience indicates that the bottom step in the residential block rate should be in the neighborhood of 2 or 2.5¢ for the ordinary company under present economic conditions.

2. For the larger residential loads we are of the opinion that a demand feature should be incorporated in the residential rate. This is necessary in order to provide a lower rate for the good load-factor customers. This feature should begin at about 5 kilowatts. The rate could then go down to something like 1.5¢ for all kilowatt hours above 150 hours use of demand. This type of treatment avoids the undesirable features of the demand charge. It provides a discount for good load factor as distinguished from a penalty for poor load factor.

This plan provides some energy at 1.5¢ for water heating for the larger customers having a good load factor. This treatment also provides a lower rate for any other appliances that may contribute to the better load factor.

3. It has been our experience that to meet competition in water heating, a rate of somewhere around 1 or 1.25¢ is required in most areas. Few power companies can sell residential service at this price except as the load is off the peak. To control the load requires a separate meter and time switch, with an investment of about $45.

The uncontrolled diversified demand of the water heater is something like 1 kw on peak. A typical power company investment is something like $200 per kw for additional power plant and transmission capacity. Here is a saving of $155 per water heater. At 15% fixed charges, this represents a difference of $23.20 per year or $1.93 per month. If the water heater requires 250 kwhr a month, here is a difference of 7.7 mills per kwhr. In other words, roughly speaking a company can make a controlled rate for water heating something like 7.7 mills lower than the uncontrolled rate.

4. As electricity cannot be stored, load factor is one of the principal considerations in pricing electric service. Both heat and water can be stored. Therefore, it appears that the electric water heater offers an excellent opportunity for improving load factor through stored heat and stored water.

5. Economic conditions change from time to time, and we must be alert to change our pricing policy accordingly. However, for the present at least, I do not see the advisability of eliminating the controlled feature in the water heater service. We can provide a controlled element in the heater under the lower controlled rate. We can also provide an uncontrolled element which floats on the line with all other appliances being billed as uncontrolled service.

Edwin Vennard
President

Middle West Service Co
20 North Wacker Drive
Chicago 6, Ill.

Larger Unit, More Calculating

To the Editor:

Regarding the summary of Mr Peters' very fine article on the calculator-rental market (Nov. 1, p 92), he states in the second paragraph thereof: "Now the industry is thinking in terms of 100-Mw or larger units. But no matter the size of the unit the amount of system planning is about the same." I disagree very strongly with this statement because the transmission and other system problems involved with a 150-Mw or 200-Mw or 275-Mw unit are definitely larger and require much more calculating board work than for a 100-Mw unit . . . unless the very good planners of that power company have planned it all out for other generator studies.

In our closely knit Duquesne Light Co system in the Greater Pittsburgh Area, the transmission and other problems certainly do take more time for a larger unit, and I have no doubt that is the experience of other power companies.

B. M. Jones
System Planning Engineer

Duquesne Light Co
435 Sixth Avenue
Pittsburgh 19, Pa.

A Matter of Accuracy

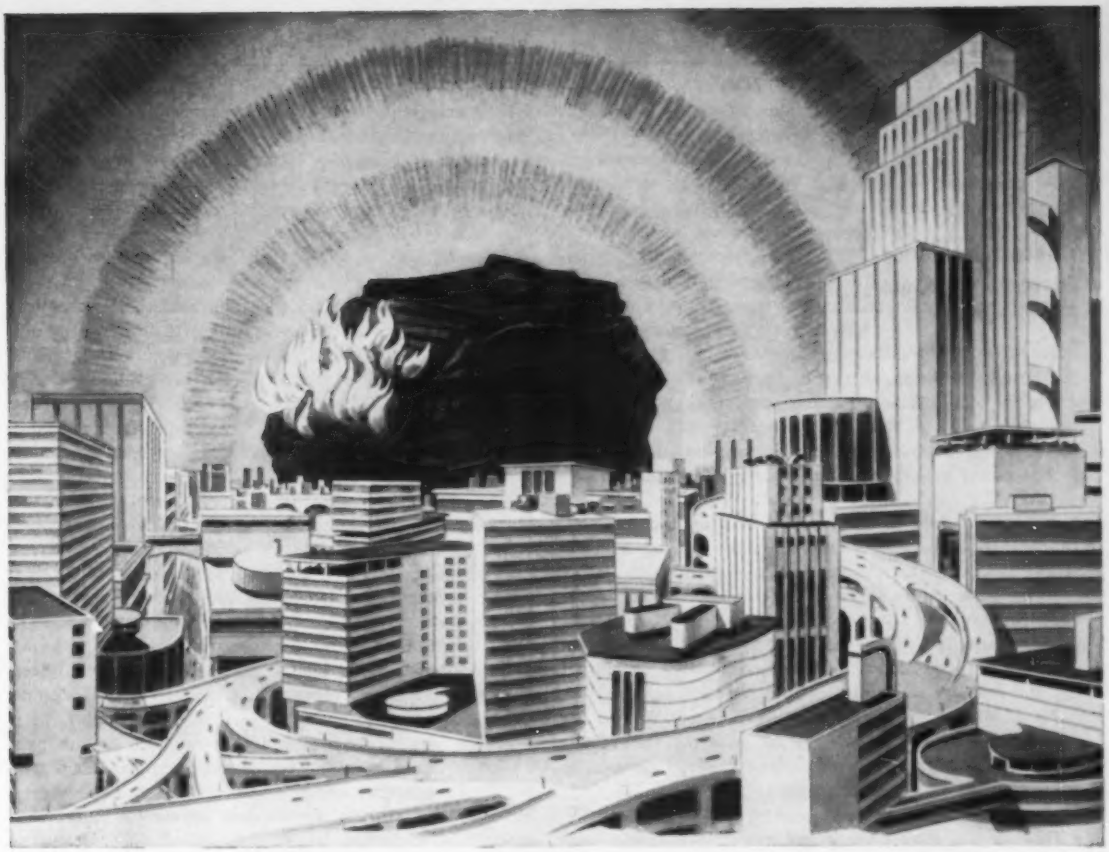
To the Editor:

Someone has sent me a tear sheet from the Nov. 15 issue of Electrical World, page 106, regarding the story, "Co-ops Team Up With Utilities." This apparently was to call attention to the fact that you say the CIPCO Plant is operated by the Central Iowa Light & Power Co. Actually Iowa Electric Light & Power Co is correct.

H. J. Rowe
Advertising Director

Iowa Electric Light & Power Co
Cedar Rapids, Iowa

• Our thanks go to Reader Rowe for catching this error and calling it to our attention. Despite extreme care, at times errors in fact slip into print.



The fuel that sparked our nation's growth secures her greater future

A young America—primed by a new and power-packed fuel—became a great industrial giant almost overnight. Coal had supplied the first unwavering spark which was to grow into the brightest productive flame the world has ever known.

After being served so well in the past and present, America looks again to dynamic coal for greater prosperity and security in the future. The vast Bituminous fields along the Baltimore & Ohio contain excellent coals in wide variety—available for centuries to come.

Highly mechanized mines, equipped and ready for any demands, will help maintain long-range cost stability. And improved utilization methods will meet the increased requirements of the future by providing greater coal-burning efficiency.

CALL ON OUR COAL TECHNICAL SERVICE

You'll receive complete information from trained B&O experts about the kind and size of Bituminous coal that fits your needs best—at a price you want to pay. Write:

COAL TRAFFIC DEPARTMENT
BALTIMORE & OHIO RAILROAD
BALTIMORE 1, MARYLAND

BITUMINOUS COALS FOR EVERY PURPOSE

LINKING 13 GREAT STATES WITH THE NATION — B&O

Baltimore & Ohio Railroad

Constantly *doing things*—better!

WASHINGTON COMMENT

Licensing of private nuclear power plants now looks like a reality by spring—maybe as early as April. There's still a lot to do, but Atomic Energy Commission staffers have progressed so well that the last set of regulations and procedures should be before the commissioners for review and approval by mid-March.

Wanted: Insurance Coverage for Atom Power Facilities

The imminence of this opportunity for large-scale industrial investment in atomic enterprises raises many a management problem. Most can be anticipated as run-of-mill decisions on manpower, financing, marketing, etc., which can best be solved as atomic plants get into operation. But there is one still unsolved which could make many eager participants less eager,—the need for insurance against improbable, but always possible, atomic catastrophe.

Underwriters Take a Look . . . Insurance companies, approached on numerous occasions, are looking into the problem themselves. Under an agreement with AEC, they are now in the process of obtaining security clearance for 10 or 12 top company executives who have been nominated by their colleagues to make a complete study of still-classified data to determine the maximum risk the industry can afford to underwrite.

No estimates exist of what insurance needs will be for privately-owned atom plants, or of what the possibilities are of loss or damage from use of nuclear fuels. The companies, so far, have only this to go on:

- Through elaborate caution and money-is-no-object safeguards, AEC and its contractors have racked up an unmatched safety record, considering the very formidable nature of the elements with which they have been working.
- The government cannot, by law, underwrite all or any part of insurance against loss or damage at a licensed private plant using government-owned fuels.
- Private utilities and manufacturers interested in operating licensed facilities under the new atomic energy law cannot afford to set aside reserves to cover insurance needs.

GE, Westinghouse Interested . . . A report, circulating in Washington, is that General Electric Co has explored possibility of obtaining insurance in the neighborhood of $100 million. Westinghouse Electric Corp is looking into the problem but as yet has come up with nothing on which it will comment.

Biggest headache to the insurance industry is the prohibition in the new law against government liability. It states specifically that licensees shall hold the government harmless for loss or damage. This prohibition does not apply to the Duquesne Light Co's new atomic power plant near Pittsburgh, since that facility is being built under a contract with AEC, not under a license. The government has agreed to foot the bill for any loss or damage resulting from use of government-owned fuels, except in case of gross negligence on the part of non-federal officials.

The prohibition rules out not only direct government reimbursement for damages but any subsidization of what could be tremendous insurance bills as well. Some industry figures, such as Francis K. McCune, head of GE's atomic products division, want the law changed to let the government take on at least some of the excess tiers of coverage which would thereby permit private companies to protect themselves against great catastrophes. Others think the insurance companies themselves should work out a plan for complete coverage.

AEC's own safety record can be expected to continue under private auspices. The regulations now being prepared at the agency contain stringent safety requirements for licensees. As the very nature of atomic enterprises make them expensive investments, added safety features, including exclusion areas surrounding such facilities, would not be prohibitive.

While the insurance companies have just reached the point where they are ready to dig into the matter on a realistic basis, one hopeful sign emerges for prospective licensees: The insurance industry recognizes its responsibility in the atomic field. It is prepared to provide as much insurance as it can possibly afford. The question at this point is—how much?

TECHNICAL NOTES

De-energized single-phase capacitors if connected in a single step to a system near its crest voltage will cause oscillations about that crest voltage and attain voltage nearly twice the normal line-to-ground.

Amplitude modulation of carrier is more susceptible to noise than frequency modulation, but the advantages of the latter are not so great as for broadcasting.

Quick start of turbine-generators is facilitated by complete temperature instrumentation for boiler waterwall headers, superheaters, burners, drums, and full length of the turbine. Readings of generator gas and winding temperatures, both rotor and stator, also contribute to quick starting.

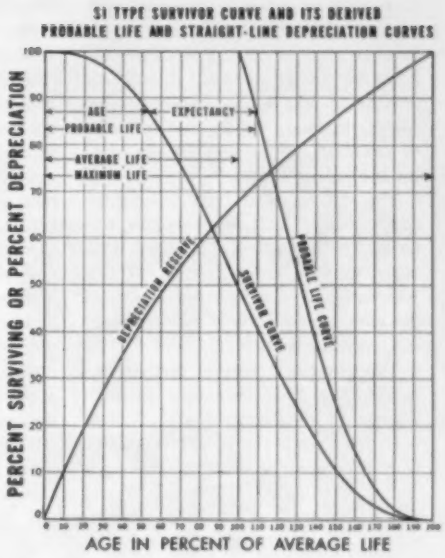
Breakers equipped with resistors of appropriate ohm value will give satisfactory operation over a range of capacitor bank sizes at least 4 to 1. Optimum resistance values are about ⅓ the impedance of the capacitor bank.

Early guide for the radius in miles of the "exclusion area" around a nuclear reactor of P kilowatts of thermal power is 0.01 P. That could mean 4-mile radius for a 60-Mw electric unit.

A nuclear reactor constructed for power purposes is physically incapable of a violent explosion. Absence of the thermal column of the bomb explosion might mean, however, wide dispersal of fission fragments if the core disintegrates.

why guess?

Be sure with an Ebasco study of depreciation problems



"Survivor Curves" are one of the modern tools used to estimate depreciation of plant for accounting purposes. Just as a "Mortality Curve" used by actuaries measures man's life expectancy as a basis for life insurance rates, this curve measures the life expectancy of your plant for depreciation estimates.

Ebasco engineers use this modern technique where applicable in solving depreciation problems for electric companies. Depreciation estimates are more valid when engineering judgment is supported by physical inspections and modern statistical tools.

Ebasco's half century of experience in all phases of electric utility operation is available to help solve your appraisal problems. Qualified appraisal engineers work closely with Ebasco's large pool of technical specialists —which assures that every aspect of your appraisal problem is given proper consideration.

Complete information about Ebasco's depreciation and other appraisal services and their application to your specific problem will be furnished on request. Or, for a full listing of the many services Ebasco offers the electric industry, send for our brochure, "The Inside Story of Outside Help". Write, without obligation: Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N. Y.

NEW YORK - CHICAGO - DALLAS - PORTLAND, ORE. - WASHINGTON, D. C.

EBASCO — ENGINEERS · CONSTRUCTORS · BUSINESS CONSULTANTS

Appraisal • Budget • Business Studies
Consulting Engineering • Design & Construction • Financial • Industrial Relations • Inspection & Expediting
Insurance, Pensions & Safety • Purchasing • Rates & Pricing • Research
Sales & Public Relations • Space Planning • Systems & Methods • Tax • Traffic
Washington Office

Ebasco Teamwork gets things done anywhere in the world

FINANCE AND REGULATION

Service Order Postponed

The North Carolina Public Utilities Commission has postponed until next April action in a case in which it was asked to order Carolina Power & Light Co to furnish power to customers now served by New Bern Municipal Power Service. But at the same time the PUC served notice that it will not hesitate to take such action "if it becomes necessary to do this in order to see that the citizens of the state get the proper service."

The order, which was written by Commissioner S. O. Worthington, was heard before Chairman Stanley Winborne and Commissioners Harry Westcott and Worthington. It was in the case of the Havelock community in Craven County, N. C.

The Havelock area is now served by the New Bern municipality which is some 18 miles from Havelock. New Bern purchases its power wholesale from Carolina P&L and the Havelock residents asked that CP&L be ordered by the PUC to furnish power to Havelock direct.

The PUC said in its order that evidence by the Havelock citizens "tends to show very definitely that the expansion and growth of the area (Havelock) has been such that it has outgrown the present power system operated by the City of New Bern and as a result thereof these citizens are not getting adequate voltage to operate their electrical equipment." The order further said, "This has resulted in damage to their electrical appliances and has been a great source of concern and worry to these people."

The PUC's order further said that the City of New Bern offered evidence and the PUC "confirms to a great extent the contentions of petitioning citizens in that their evidence tended to show that the city has recently had a survey made by a competent electrical engineering firm—that this survey shows definitely that the voltage going to these petitioning citizens is not constant—is not adequate and such condition is due to the lack of adequate line capacity from the City of New Bern to this territory."

The order then noted that the PUC has no jurisdiction over the operations of New Bern. But that it is entrusted with the duty of seeing that the citizens of the state receive "reasonably adequite public utility service."

The PUC ordered the matter held in abeyance until April 1. "With the understanding that if by that time the City of New Bern is not rendering adequate electric power service to the citizens in the Havelock section, who are their customers, then this commission will make such order in this matter as it sees it and deems necessary in order to provide these citizens with adequate electric power service."

Calepco Gets Rate Hike

The Public Utilities Commission of California has granted the California Electric Power Co a rate increase of $1,207,000 a year as compared with $1,217,400 requested. The increase amounting to 8.97% will affect "all present rates other than schedules effective in the San Bernardino area, the resale schedule, the Mineral County and Hawthorne service, interchange service, and interdivisional operations." The rate order was dated Dec. 28, 1954.

As to the proceedings, it is evident that no substantial disagreement existed between the company and the staff. The estimated results of operation showed a return on a net original cost rate base for 1954 of 5.42% by the company and 5.40% by the staff of the commission.

The company in petitioning for a 6.25% rate of return introduced exhibits showing rates of return of 54 comparable utility companies in various parts of the United States, which earned 6.35% on their invested capital dedicated to public service.

The PUC noted that such information, while interesting, was not material to these proceedings since "—it is the practice of this commission in fixing rates to concern itself primarily with the determination of the fair return to be allowed on the investment in rate base which pertains to applicant's electric operations in California."

As to the findings on the rate of return, the order said "We find that 6% is a fair and reasonable rate of return for applicant to earn in the future on its California electric operations. To compensate for an admitted down trend in rate of return and in order that applicant may earn such 6% return for the future, a 6.25% rate of return will be applied to the adopted rate base of $63,630,000 for the estimated year 1954, which rate base we find to be reasonable."

FINANCIAL BRIEFS

Quebec Power Co's stockholders subscribed to 98.14% of 110,682 common shares offered on a 1-for-5 basis at $23 a share.

Shawinigan Water & Power Co plans to offer its stockholders about 220,000 common shares on a 1-for-10 basis, record about Feb. 1.

New England Power Co has received Federal Power Commission approval to merge Connecticut River Power Co into it . . . **California Oregon Power Co** has also received FPC approval to sell about 22 miles of transmission lines in Douglas and Coos Counties, Ore., to U. S. Government . . . **Duquesne Light Co** has received Office of Defense Mobilization approval for a five-year tax writeoff on $14 million of atomic facilities to be installed at Shippingport, Pa., plant now being built in cooperation with the Westinghouse Electric Corp.

Increased Dividends . . . Union Electric Co of Missouri will pay March 31 a quarterly common stock dividend of 35¢ a share as compared with 30¢

THIS IS THE *INTERRUPTER...*

BROWN BOVERI

AIR BLAST BREAKERS

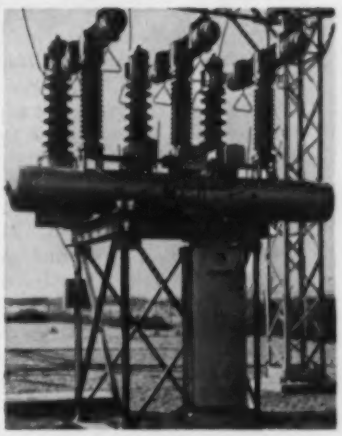
GOOD circuit breaker design calls for getting the interrupting medium between the contacts as FAST and as EFFICIENTLY as possible.

In practice, the best way is to use a low inertia medium — such as *air* in contrast to *oil* — controlled by a few, light, moving parts. **The interrupter (shown above) with its small, precision parts, releases the arc-quenching blast of air almost instantly.** Note the absence of heavy, moving parts in this important assembly.

This, and similar engineering achievements, make possible all these advantages which only a Brown Boveri Air Blast Breaker can provide:

1 – High Interrupting Capacity
2 – High Current Carrying Capacity
3 – High Speed
4 – Rapid Reclosing
5 – Positive Interruption under All Conditions
6 – Proven Dependability
7 – Low Initial Cost
8 – Low Installation Cost
9 – Minimum Maintenance
10 – Rapid and Easy Inspection

You can EXPECT MORE . . . and GET MORE from a Brown Boveri Outdoor or Indoor Air Blast Breaker. **Get the facts TODAY!**



69 kV Brown Boveri Air Blast Breaker in Cochise Substation, Bureau of Reclamation, Phoenix, Ariz.

BROWN BOVERI

BROWN BOVERI CORPORATION

19 RECTOR STREET • NEW YORK 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Butte, Mont. • Chicago, Ill. • Cleveland, O. • Denver, Colo. • Detroit, Mich. • High Point, N.C. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Lewiston, Me. • Los Angeles, Cal. • Minneapolis, Minn. • New Orleans, La. • New York, N.Y. • Portland, Ore. • San Francisco, Cal. • Seattle, Wash. • Tucson, Ariz.

in previous quarter . . . Puget Sound Power & Light Co will pay Feb. 15 a common quarterly stock dividend of 43¢ a share versus 41¢ previously.

Iowa Electric Light & Power Co has sold privately $9 million of first mortgage 3-⅛% bonds due 1985 to 15 institutional investors . . . **Carolina Power & Light Co** has received North Carolina Public Utilities Commission approval to sell 50,000 shares of $100 par 4.20% preferred stock to institutional investors at par. . . Smith, Barney & Co sold quickly a secondary offering of 10,000 shares of common stock of **Otter Tail Power Co** at $28.

A tabulation of electric and gas utility company common stocks has been prepared by the First Boston Corp. For copy write: George Perrin, vice president, 100 Broadway, New York.

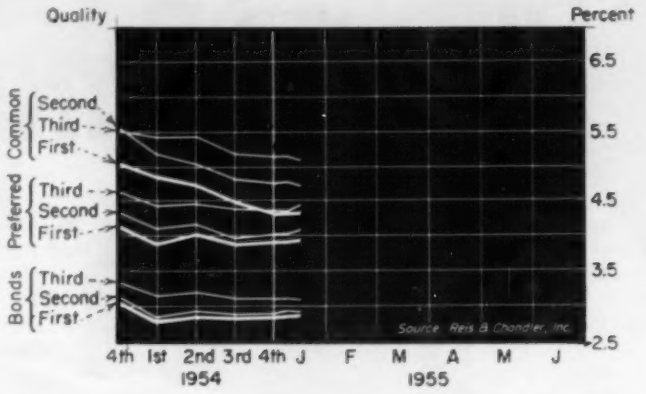
Blyth & Co sold quickly a secondary offering of 2,000 common shares of California-Oregon Power Co at $31 a share. Smith, Barney & Co also offered 7,500 common shares of California-Oregon Power at $31 on Jan. 12 but unsold balance was withdrawn on Jan. 13.

REGULATION

Central Maine Power Co has issued an interesting booklet "Our Side of the Story," by William F. Wyman, president of the company. It is a statement regarding the company's recent rate case and the Maine utility rate law. For copy write, W. F. Wyman, 9 Green St., Augusta, Me.

Rate Increases . . . Western Light & Telephone Co has received Kansas Corporation Commission approval to raise rates $297,000 a year . . . Ark Valley Electric Co-Operative Association, Hutchinson, Kan., also received approval to increase rates $16,200 annually . . . Citizens Utilities Co has received Arizona Corporation Commission approval to raise rates 7.8 mills per kwhr in Kingman, Ariz., effective Jan. 1. . . Central Illinois Public Service Co has received Illinois Commerce Commission approval to raise rates $8,200 a year in Bushnell. City's municipal plant recently increased rates and the new CIPS rates meet this boost.

Today's Utility Yields (%)



	BONDS			PREFERRED STOCKS			COMMON STOCKS		
QUALITY	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Jan. 13	2.90	2.94	3.11	3.95	4.08	4.43	4.34	4.72	5.10
Jan. 6	2.89	2.93	3.11	3.93	4.07	4.37	4.36	4.80	5.18

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1954	NET INCOME 1953	EARNINGS PER COMMON SHARE 1954	EARNINGS PER COMMON SHARE 1953
Central Maine Power	11	Nov.	$5,352,977	$4,068,834	$	$ ....
El Paso Electric	12	Nov.	2,196,786	1,685,701	2.48(a)	2.12(a)
Gulf States Utilities	12	Nov.	9,783,371	9,304,039	1.95	1.84
Iowa Electric Light & Power	12	Nov.	3,225,282	2,792,501	1.77	1.58
Tamp Electric	12	Nov.	2,878,093	2,633,588	3.99	3.67
Utah Power & Light	12	Nov.	5,763,814	4,912,931	....	....

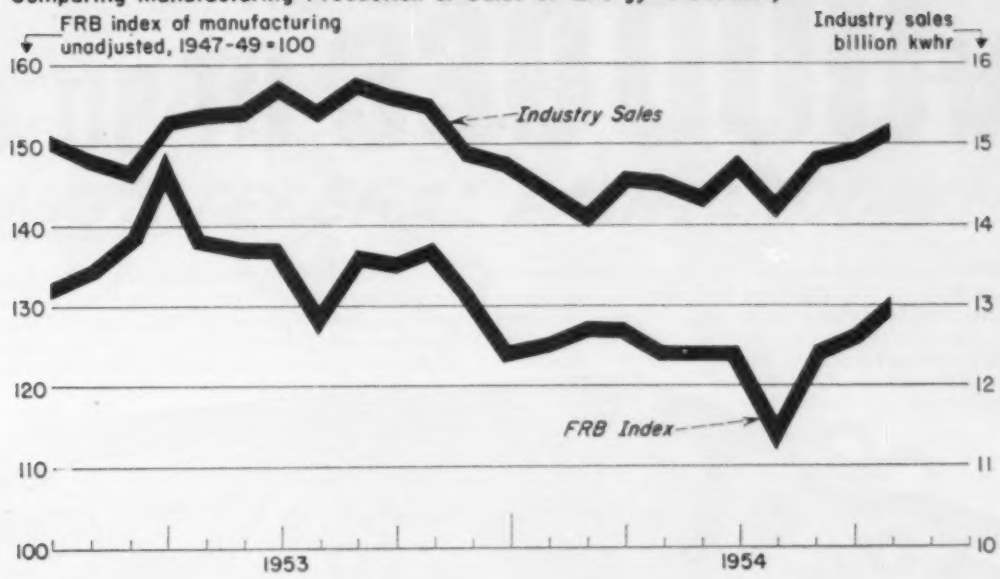
Note—(a) Based on 840,387 shares in 1954 and 763,988 shares in 1953.

Utility Financing

COMPANY AND DESCRIPTION	AMOUNT OF OFFERING (000)	OFFERING PRICE	YIELD TO PUBLIC
WEEK OF JANUARY 13-19			
BONDS			
New England Power—1st mtg 3¼% due 1985	$25,000	101.931%	3.15%
PREFERRED STOCK			
Toledo Edison—100,000 sh $100 par 4.25% cum	$10,000	$100.00	4.25%
COMMON STOCK			
Duquesne Light—450,000 sh	$15,863	$35.25	5.11%
Toledo Edison—400,000 sh	(See Electrical Week Page 111)		
SCHEDULE FOR JANUARY—FEBRUARY			
BONDS AND DEBENTURES			BID DATE
Consumers Power—1st mtg due 1990	$30,000	.....	Jan. 25
Los Angeles, Calif., Department of Water and Power electric plant revenues	18,000	.....	Jan. 26
Dallas Power & Light—debs due 1980	7,000	.....	Feb. 14
Kansas City Power & Light—1st mtg due 1985	16,000	.....	Feb. 15
Texas Electric Service—1st mtg due 1985	17,000	.....	Feb. 23
Western Light & Telephone—1st mtg due 1985	3,000	.....	.....
PREFERRED STOCK			
Duquesne Light—160,000 sh $50 par	$,000	.....	Jan. 20
COMMON STOCK			
Missouri Utilities—27,420 sh (to be offered common-holders on a 1-for-10 basis, record Jan. 12 to expire Jan. 26)	.....	.....	.....
Western Light & Telephone—about 40,000 sh	.....	.....	.....

STATISTICS

Comparing Manufacturing Production & Sales of Energy to Industry



Power Statistics . . .

			Latest Month	Preceding Month	Year Ago	Annual Change%
Capacity	million kw	Nov.	101.12	100.01	89.81	12.6
Peak—Class I Systems	million kw	Oct.	79.9	79.4	74.0	8.0
Estimated Dec. '54 Peak	million kw	Oct.	87.8	87.8	91.0	− 3.5
Production—billion kwhr		Nov.	40.22	40.46	36.43	10.4
hydro			8.12	7.83	6.99	16.4
fuel			32.10	32.63	29.44	9.0
Sales—billion kwhr		Oct.	33.75	34.05	32.21	4.8
residential			9.70	9.76	8.70	11.5
commercial			6.40	6.69	5.62	13.9
industrial			15.24	15.00	15.56	− 2.1
other			2.41	2.60	2.33	3.4
Fuel Consumption		Nov.				
coal—million tons			10.70	10.34	10.19	3.5
oil—million barrels			5.82	5.32	6.91	−15.8
gas—billion cu ft			88.66	108.49	80.58	10.0
Net Income Class A & B Co's—$ million		Oct.	86.92	92.41	75.62	14.9
Residential Customers—millions			42.95	42.84	41.79	2.8
revenue per kwhr		12 mos.	2.70¢	2.70¢	2.75¢	− 1.8
avg kwhr per customer		ended	2,512	2,496	2,317	8.4
avg annual bill		Oct.	$67.82	$57.39	$63.72	6.4

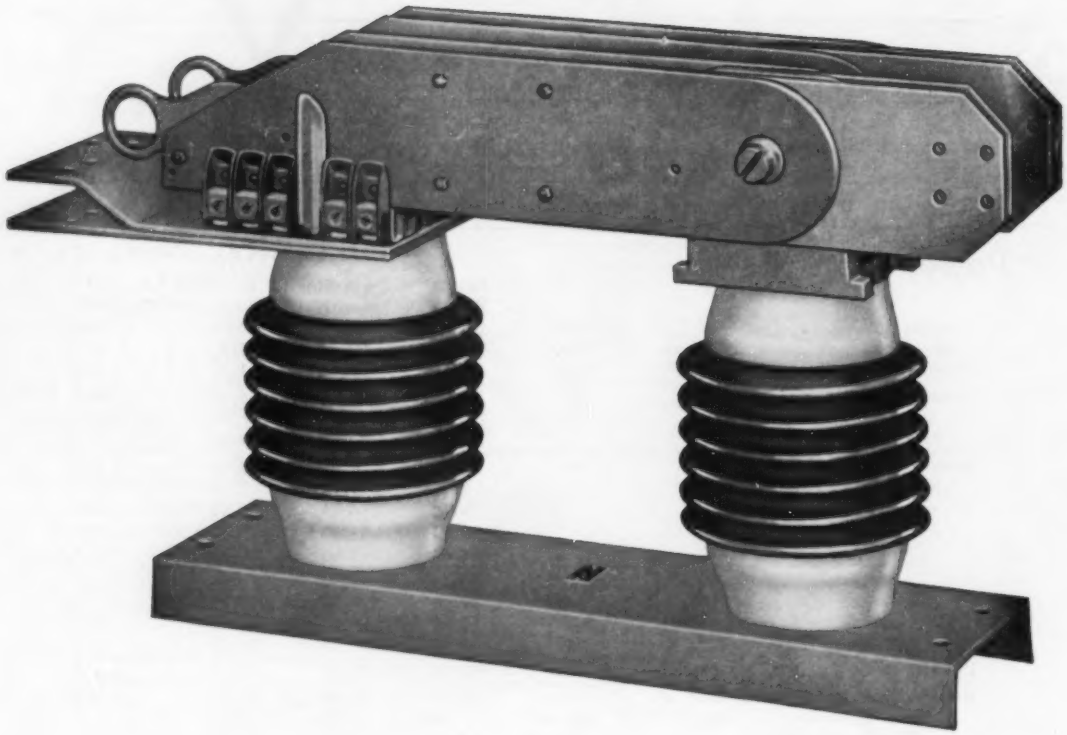
Business Statistics . . .

Indexes: 1947—49 = 100					
FRB Industrial Production	Dec.	128	130	124	3.2
ENR Construction Cost	Dec.	134.9	134.8	128.2	5.2
BLS Cost-of-living	Nov.	114.6	114.5	115.0	− 0.3
NEMA Sales	Nov.				
insulation materials		124	117	130	− 4.6
electric appliances		90	102	70	28.6
household refrigerators		47	51	35	34.3
Wholesale prices	Nov.				
motors and generators		121.8	121.8	124.3	− 2.0
transformers and regulators		128.1	128.1	128.1	.....
switchgear and fuses		135.2	135.1	135.0	0.1
GNP—annual rate—$ billion	3rd qtr	355.5	356.0	367.2	− 3.2

Cole Electric Co.

8439 Steller Drive — Culver City, Calif.

TExas 0-4701



OUTDOOR HOOK STICK DISCONNECTING SWITCH

23,000 Volts—4,000 Amperes—Type Y-2

Single Pole, Single Throw

See Bulletin 20-A

SILVER TO SILVER CONTACTS

110v UP TO 330,000v

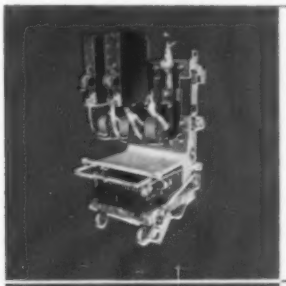
THAT'S FEDERAL PACIFIC TODAY!

FOR YEARS NOW, Federal Noark® devices for control and distribution of low voltage electrical energy have enjoyed a sales growth unprecedented in the industry. Many of these devices—safety switches, molded-case breakers (including epoch-making Stab-lok®), fusible service equipment, switchboards, industrial controls, etc.—have featured improvements of top value to wholesalers, contractors, and users alike.

And today, through amalgamation of many companies, Federal Pacific brings you similar outstanding advantages in new lines of assembled switchgear *plus* a line of high voltage outdoor switchgear whose unsurpassed merit is recognized by utilities throughout this country and abroad.

From now on, assure yourself the best in engineering and performance . . . specify Federal Pacific equipment all the way from 110v right up to 330,000v! Ten plants from coast-to-coast spell fast service, too!

THEY'RE NEW—THEY'RE FEDERAL PACIFIC

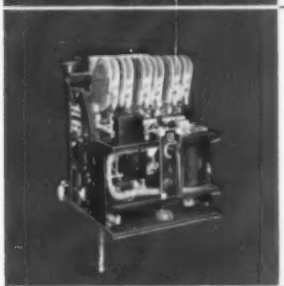


HIGH-VOLTAGE METAL-CLAD DRAWOUT SWITCHGEAR

This is a DST Magnetic Air Circuit Breaker—the heart of Federal Pacific Metal-Clad drawout switchgear. Available in both 5 kv and 15 kv ratings, these breakers are housed in individual, free-standing enclosures, bolted into a complete switchgear assembly. All units are wired, adjusted, and given an operational test at the factory. Indoor and outdoor enclosures.

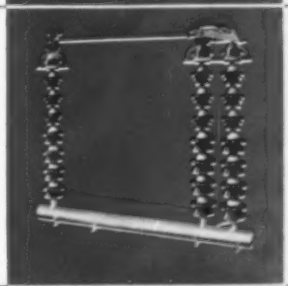
UNIT SUBSTATIONS

Federal Pacific Unit Substations provide a coordinated installation of high-voltage entrance and protective equipment, transformer, and switchgear . . . 5 kv and 15 kv primary and 600v secondary substations available for indoor and outdoor service.



LOW-VOLTAGE METAL-ENCLOSED DRAWOUT SWITCHGEAR

Type DMB drawout air circuit breakers are the protective devices of Federal Pacific Low-Voltage Switchgear. Complete in range from 15,000 through 100,000 amperes interrupting ratings, these breakers are housed in standardized sections that lower installation costs and minimize delivery time.



AIR BREAK DISCONNECTING SWITCHES

Federal Pacific complete line of outdoor disconnecting switches includes both group-operated and hook-operated designs.

Group-operated, vertical-break switches range from 7.5 kv up through 330 kv (illustrated); side-break switches available from 7.5 to 115 kv ratings.

OUTDOOR OIL CIRCUIT BREAKERS

Federal Pacific Oil Circuit Breakers range from 50 mva at 7.2 kv, to 25,000 mva at 330 kv. This complete line is the outgrowth of 50 years' experience on some of the world's largest high-voltage distribution systems.

TRANSFORMERS

Transformers—both liquid and air-cooled—are available in a range through 69 kv. The line includes oil-immersed distribution and power transformers; auto, subway, and dry-type transformers; and several specialty groups such as for neon signs.

FEDERAL PACIFIC ELECTRIC CO.

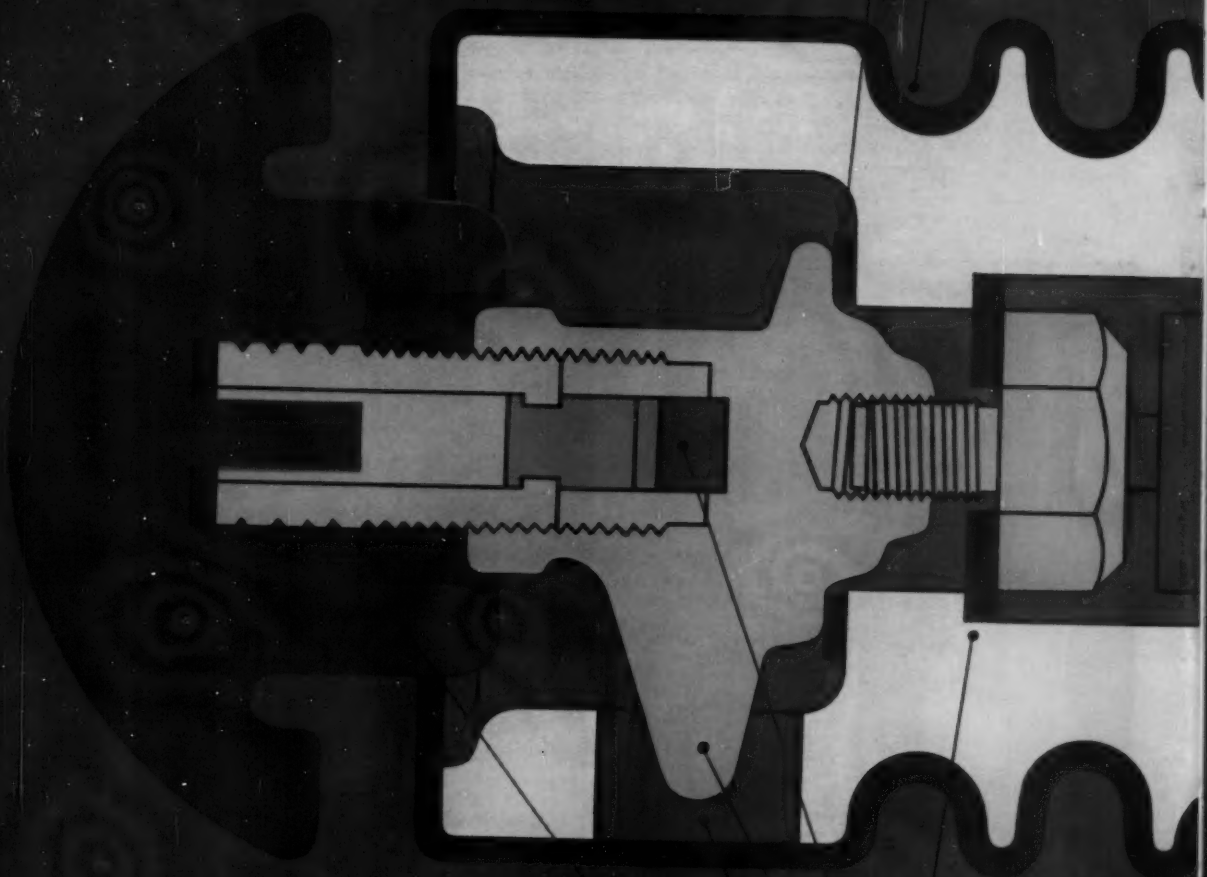
FORMERLY—FEDERAL ELECTRIC PRODUCTS COMPANY AND PACIFIC ELECTRIC MANUFACTURING CORP.

Main Office: 50 PARIS STREET, NEWARK 1, N. J.

Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches ★ Sales offices in principal cities.

QUICK-GRIP BUSHINGS—
a KUHLMAN first*

a twist of the knob completes the job


Corprene gasket prevents all leakage.
Corrugations designed for ample creepage distance independent of position or angle of mounting.
Washer.
Cable can be entered from two sides.
Electrode for isolating gap in arrester in protected transformers and co-ordinating gap in conventional transformers.
Bushing gap opening.
Hard rubber knob prevents accidental contact with parts.

*ORIGINATED BY KUHLMAN IN 1939
Oilwell bushing for distribution transformers 3 thru 167 KVA below 5000 volts.

KUHLMAN

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN, CRYSTAL SPRINGS, MISSISSIPPI, [illegible], CALIFORNIA